QST

amateur radio

The RADIO AMATEUR'S HANDBOOK

we want you to buy a handbook. you need it. for over four years we've been talking up the handbook and we've sold over 120,000 copies of it all over the world. that's because it's good. it sells itself. everybody who sees it must have one. through twelve printings, constantly revised, it has presented the most modern information in the world for radio amateurs. nothing can compare with it, for it is written for amateurs by practical amateurs who know their stuff. the headquarters staff of the a.r.r.l. the apparatus chapters answer every question. suppose it's receivers you're interested in: here are various band-spreading schemes, a simple two-tube d.c. receiver, a three-tube a.c. one, a fine four-tube peaked one, a superhet converter, or is it transmitters?: a single control low-powered baby, a 210 hartley, 852's in push-pull, 210's in m.o.p.a., crystal rigs with sundry doublers, and high-power amplifiers. antennas? all of them, hertz and marconi, end-feed, center-feed, sliding-feed, voltage and current feed. power supply? one for every rig and purse. radiophone? you bet: world's hottest dope on 100% modulation and tube combinations, speech amplifiers and modulators for every ham power. whole chapter on keying and trouble shooting. then there are chapters on what amateur radio is all about, how it works, how radio works . . . explained so you can understand it, too . . . how to operate, how to handle messages. a complete treatment of operating procedure by famed communications manager handy, original handbook author. yes, all of this sounds like a five-dollar book. it would be if it were produced in ordinary fashion but the handbook isn't. it's printed "qst" format and gets the 187,654 words and 200-odd illustrations of a big textbook down to a price all can afford. no wonder it is the most helpful publication ever made available for anyone interested in amateur radio. price? a modest one dollar in heavy red-and-gold paper covers, anywhere in the world. or if you're fussy, stiff buckram binding for two dollars, postpaid. as we said at the beginning, you can't get along without this peerless guide in all amateur activity. order your copy today! eighth edition.

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American Radio Relay League

West Hartford Connecticut, U. S. A.

• EDITORIAL •

DID you ever stop to think what you get for your two dollars and a half dues in the A.R.R.L.? Here is a figure which represents the ordinary annual subscription price to a magazine which sells for a quarter on the stands, yet it is the sum total paid as dues by the League member and represents not only his subscription price to *QST* but his entire payment of dues for the year.

In addition to receiving the magazine which we all love and cherish, the member receives the benefit of countless activities which our union in a League makes possible. First the costs of our very system of government are met by the League, including the travel expense necessary to bring the Directors together for their annual two-day meetings. Then there is the Communications Department, planning our operating activity with a view to bringing to each of us a great deal more enjoyment from the pursuit of amateur radio than would be our lot as unorganized individuals, arranging tests, improving procedure, maintaining W1MK. There is the constant participation of the League down through the years in every matter that affects amateur rights in legislation or regulation — internationally, nationally, municipally — involving endless travel and endless days of work by numerous representatives. There's the free technical information service for members, with its many thousands of letters of advice and suggestion every year; the administration of League conventions and much headquarters travel to visit them and our affiliated clubs; national newspaper publicity for amateur radio; such varied special things as sending Godley to Scotland, Mix to the Arctic, and running a technical development program. And, on top of it all, providing a headquarters where there will be somebody to worry about the whole course of amateur radio, keep a watchful eye on trends, and do something about them.

It costs a great deal of money to maintain these activities. The membership dues do not near support them. It cost $167,482 to run the League last year. The dues paid by members amounted to $42,595, just about one-fourth of the cost. The remainder — and here is an important point — was made up by revenues derived from outside sources, such as advertising, newsstand distribution, the sale of radio literature. If members really paid for the things the League gives them, the dues would be nearly four times what they are — say ten dollars a year, the average amount in the national engineering societies. Enterprise in permissible outside activities brings down the amount that the member must contribute to a quarter of what it otherwise would be. It is much like the occasionally-encountered tax-free town, where the municipality owns the utilities or an oil-well and derives enough revenue therefrom to lower taxes materially.

Don't think lightly of your League because its dues are low. Be proud of it, instead, for you get an awful lot for your money. Moreover, when you pay dues you become part owner of a membership corporation whose surplus, if liquidated and pro-rated amongst the members, would bring you a dividend check for nearly two years' dues. League membership, any way you look at it, is a good investment.

K. B. W.

Warner Goes to Copenhagen

K. B. WARNER, Secretary of the A.R.R.L. and editor of *QST*, has again been named by the Department of State as a member of a United States delegation to a meeting of the International Technical Consulting Committee on Radio Communications (C.C.I.R.), which this year meets at Copenhagen, Denmark, from May 27th to June 8th. It will be remembered that he had a similar appointment as technical adviser on the delegation to the first meeting of the C.C.I.R. at The Hague, in 1929. The organization rules of the C.C.I.R. provide for participation by governments and commercial companies but not for other classes of radio, such as amateurs. Mr. Warner's appointment to the delegation is this government's method of insuring amateur representation. The delegation sailed on the *America* on May 13th and will return late in June.

The C.C.I.R. is advisory in its functions, confines itself to technical matters, cannot change amateur frequency assignments, power, etc.

In This Issue

IT so happens that most of the technical matter this month is the product of Headquarters' personnel. Quite a large slice of it is devoted to the description of circuits and equipment for the ultra-high frequencies — which, we need hardly say, is getting to be "hot stuff" these days. The amateur is not by any means alone in finding that the waves below 10 meters have a wide (even though not DX) field of usefulness. Indications point to the probability of a future ultra-high frequency spectrum swarming with telephone communication system, television transmitters and broadcast stations.

James Lamb, whose article faces us at the moment, has had this ultra-high frequency work as his chief side interest during the last few weeks. As a result, the laboratory has been even more than ordinarily crowded with oscillators of every description and the associate modulation and power supply equipment. Though thoroughly practical 56 mc. phone communication has been demonstrated in this work it is not suggested that the apparatus employed is necessarily the "last word." There is a great deal more on the hook than could possibly be presented in a couple of *QST* stories. Hull's spare time activity has been chiefly in the realm of reception on 56 mc. His receiver, described in this issue, is representative of the type of equipment which is almost certain to find wide application. From the present viewpoint it would seem that super-regeneration is to accomplish for the high frequency television receiver just about all that we could wish. He is working now with a companion transmitter to the super-regenerative receiver — occupying a "can" of the same size. His plans are complete for some inter-'plane tests with this equipment.

George Grammer, though having his hand in the ultra-high frequency business, has been more interested in the problems of crystal control for those enormously low frequencies below 14,000 kc. He has been working toward the simplification of preliminary amplifier equipment and the improvement of efficiency in doublers. The unit detailed in his story is the beginning of an experimental transmitter for the lab. which is to end up with four Type '52's in push-pull parallel.

On the hook, and held over for the early future there is some juicy technical stuff. In "What Is This Thing Called Decibel? — An Amateur View of the Transmission Unit," James McLaughlin and James Lamb conspire to make the Decibel something utterly simple and unbelievably useful in amateur work. Then there is "The Mechanics of Modulation," by Paul Huntsinger; "An Inexpensive Constant Temperature Crystal Oven," by Louis Lauman; "Single-Tracking the Superheterodyne," by F. I. Anderson; "Break-In Operation and Interference Elimination," by Robert Foreman. Aside from other similar material there is, of course, more to come from our Laboratory, with the ultra-high frequencies as the very probable subject matter.

Strays

In 1934, when radio conditions reach the peak, we'll have to have WAP (Worked All Planets) certificates, as ham radio will be a wow at that time!

— *W2CQX*

A novel way of changing your note from d.c. to r.a.c. is to set up the transmitter on the sleeping porch. As the weather changes so does the note — in fact, the electrolytic condensers may freeze to the extent that transporting them to the kitchen range may be necessary before the old d.c. returns.

— *W9CRT*

We note the formation of two institutions for the study of radio law. Announcement comes from the Air Law Institute of Northwestern University School of Law at Chicago, Illinois, of the establishment of the *Journal of Radio Law*, which will be published quarterly commencing April 1, 1931. The *Journal* will have service features concerned with pending regulation by the Federal Radio Commission, radio legislation and decisions, and international developments.

The New York University School of Law has also announced the formation of the American Academy of Air Law, the purpose of which will be to conduct and encourage research into aeronautical and radio law, and to continue the publication of the *Air Law Review* which, since January, 1930, has been devoted to the consideration of legal problems, both of aviation and radio.

The legal problems related to amateur communication in both organizations will come under the control of the General Counsel of the League, Paul M. Segal, Esq., of Washington, D. C.

On the *Journal of Radio Law*, Mr. Segal is a member of the Editorial Advisory Board, and in charge of the department relating to the general trend of radio regulation.

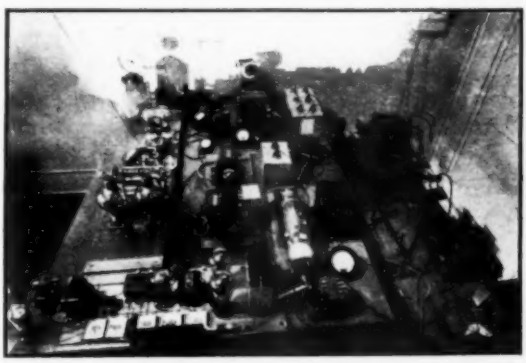
In the Academy of Air Law Mr. Segal is a member of the Advisory Board on Radio and author of an article, "The Regulation of Amateur Radio Communication," which appeared in the April, 1931, issue of the *Air Law Review*.

Developments in Ultra-High Frequency Oscillators

By James J. Lamb, Technical Editor

WITHIN the last year there has been a revival of interest in the frequencies lying in the region above 30 mc. (10 meters) and frequencies above 56 mc. have become particularly attractive. This has been brought about to a considerable extent by a continually growing awareness of the utility of these frequencies for restricted communication purposes, to which they are peculiarly fitted, and furthered by the somewhat spectacular communication stunts that recently have been given wide publicity in the public press. To the amateur way of thinking, and in the opinion of others as well, the limited range of ultra-high frequency signals has been taken as a decided handicap to their practical usefulness, most probably because it had become almost traditional that the higher the frequency the better the DX — until early experiments with frequencies above about 30 mc. began to show that there was something sour about this idea and that the frequencies in this region were not so good for DX, not even as good as the frequencies below 1500 kc. (wavelengths above 200 meters). And we decided forthwith that being no good for DX they were no good at all.

But now there is a new trend of opinion. What was once considered a paralyzing liability is being found an attractive asset. The limited range of these frequencies makes them peculiarly fitted for short-haul point-to-point services and even for restricted general broadcasting where it is advantageous to have effective coverage in the immediate area and keep the signals from being effective outside this area. This suggests short over-water or overland jumps in telegraph and telephone circuits; local broadcasting for sound and television entertainment; municipal police radio which does not cause interference to police services in towns a hundred miles or more distant; and amateur 'phone and c.w. communication for those activities which do not require and are handicapped by the use of DX frequencies, and which are exactly satisfied by the peculiar properties of ultra-high frequencies such as we have available in the 56-mc. band. What activities, you ask? Why, working across town; rag-chewing with the local gang on Sunday morning; furnishing communication for community events such as air-race meets and regattas; to say nothing of the pure fun that the experimenters can have exploring the country in a car equipped with a receiver like the one that Ross Hull describes elsewhere in this issue and getting the same kick that we get out of the unexpected things that 56-mc. signals can do. And this brings us to the how of it, particularly to what we have learned from some recent experiments with ultra-high frequency oscillators and simple transmitters.



OSCILLATORS, SPEECH-AMPLIFIER AND MODULATOR SYSTEMS

Power supplies, and whatever — used in the course of the 56-mc. experiments.

TYPES OF OSCILLATORS

Although the region of frequencies with which we are dealing is usually considered as a whole and is generally described as "ultra-high" or "quasi-optical" (the latter because the waves in some respects seem to behave like those of light) it is necessary to divide them into two classes when it comes to the consideration of their generation and reception. Frequencies below about 200 or 300 megacycles (wavelengths above 1.5 or 1 meter) can be obtained in a practicable manner by vacuum tube oscillators of the usual regenerative variety, utilizing circuits such as the Armstrong, Colpitts, Hartley, and their modifications.

The skeletonized appearing affair illustrated is a push-pull Armstrong (t.g.t.p.) oscillator that was used to investigate the high-frequency limits of regenerative type of oscillators using commercial tubes. With the VT-14 or CG-1162 [5] tubes shown, oscillations sufficiently stable to be measured with Lecher wires were obtained at 214 mc. (144 cm.). Since the tubes have metal

bases and were mounted in standard UX sockets this limit is surprisingly high. Type '10 tubes were made to oscillate reliably at 180 mc. (160 cm.) with the grid circuit jumper across the grid terminals of the sockets. The schematic circuit of the oscillator is given in Fig. 1. Tuning is like that of any t.g.t.p. oscillator, the short-circuiting links being moved along the parallel wires to tune the grid and plate circuits. Not more than 300

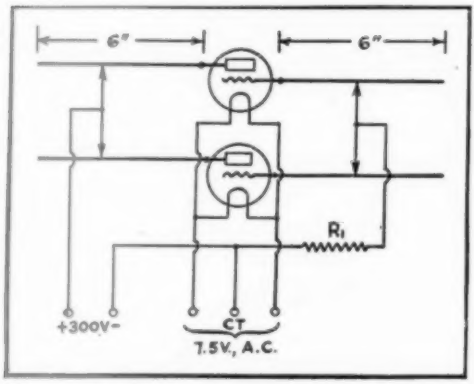


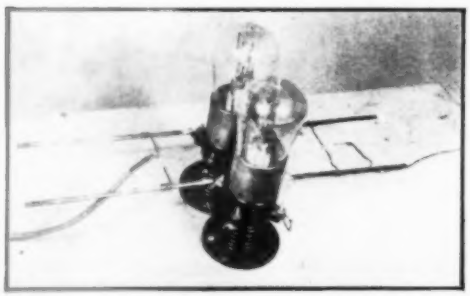
FIG. 1 — REGENERATIVE PUSH-PULL OSCILLATOR FOR WAVELENGTHS DOWN TO 1.4 METERS

The grid and plate circuits are tuned by sliding the "jumpers" along the parallel wires.

R_1 is a grid-leak having a resistance of 20,000 ohms or more.

volts should be used on the plates of Type '10 or similar tubes because of the danger of breakdown in the stem. This is explained in detail further on in this article.

The upper frequency limit for regenerative type oscillators using triodes is somewhere in the region of 300 mc. The absolute limit is reached



THERE ISN'T MUCH TO THIS ULTRA-HIGH FREQUENCY REGENERATIVE TYPE OSCILLATOR

Using standard tubes, bases and all, it goes down to 1.4 meters.

where the velocity of the electrons and the path that they take in transit within the tube itself becomes the controlling factor — inter-electrode capacities alone do not set the limit, as is sometimes thought — and the grid and plate circuit phase relationship upon which the regenerative oscillation depends is no longer effective. Therefore, for very short wavelengths a different type of oscillation must be used. A type of oscillation is necessary which does not depend on the usual regenerative principle but which is based on a radically different theory. Fortunately oscillations of this different kind can be obtained and their development has reached a stage where they can be handled in a practical way. Frankly, we do not know a great deal about them and at the time of this writing have not had the opportunity of making a thorough first-hand acquaintance with their peculiarities. We are at it, however, and for the benefit of those whose appetites may be whetted like ours have become we shall pass on a sketch of what information we have been able to collect. Obviously, these "electron" oscillations are especially promising for practical work in the amateur 75-cm. band. Incidentally, oscillators of this type were used in the recent stunt of communicating across the English Channel between Dover and Calais on a wavelength of about 20 cm.

Since the primary concern of this article is developments in regenerative oscillators for the lower quasi-optical frequencies, particularly the 56-mc. band, the present treatment of "electron" type oscillators necessarily must be condensed.

ELECTRON OSCILLATIONS

As suggested above, this oscillation is not a function of regenerative action by merit of elec-

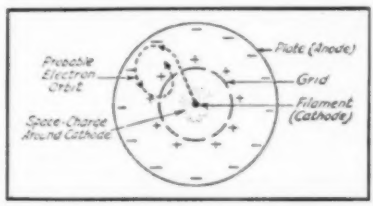


FIG. 2 — AN ILLUSTRATION OF THE ELECTRON OSCILLATION GIVING THE BARKHAUSEN EFFECT

The electrons actually oscillate about the positive grid, describing orbits between the electron emitting cathode and the negative plate.

trostatic or electromagnetic coupling between the grid and plate circuits of a vacuum tube but is a result of actual oscillation of the electrons between the electrodes of the tube. The phenomenon is universally known as the Barkhausen or Barkhausen-Kurz effect,[1] for its discoverers; and practical arrangements for obtaining the oscillations with three-element tubes are known as Barkhausen-Kurz and Gill-Morrell.[2] Barkhausen-Kurz (B-K) and Gill-Morrell (G-M) oscillators are quite similar in circuit arrangement, taking

[1] Barkhausen and Kurz, *zeitschrift für Physik*, Vol. 21 (1920), No. 1.

[2] Gill and Morrell, *Philosophical Magazine*, Vol. 44 (1922), 161, and Vol. 49 (1925), 369.

the form shown in Fig. 1. The filament is heated in quite normal fashion *but the grid is highly positive with respect to the filament and the plate is at zero potential or slightly negative.* In operation the electrons emitted by the filament are attracted to the highly positive grid and acquire a pretty good velocity in the process. In fact some of them acquire such a high velocity that they travel on toward the plate and would continue to that destination were they not met with discouragement. The unfriendly negative potential on the plate does the discouraging and they swing about, take the return path to the positive grid, pass through it again, and once more join the procession of electrons leaving the filament. (Fig. 2.) In the true Barkhausen oscillation, the orbit that these electrons describe and the velocity with which they do it determine the frequency *independently of the constants of the external circuit.* The length of the path is of course dependent on the spacing between the electrodes and the velocity is affected by the positive grid potential. This has been stated by Barkhausen and Kurz in the form of an approximate equation:

$$\text{Wavelength} = \frac{1000\, d_a}{\sqrt{E_g}}\ cm.$$

where d_a is the distance between the electrodes in *cm.* and the grid voltage is E_g, when the filament and plate are both at zero potential. In this relation plane electrodes and equal spacings are assumed and the effect of space charge (which is likely to be considerable at low grid voltages) is not taken into account.

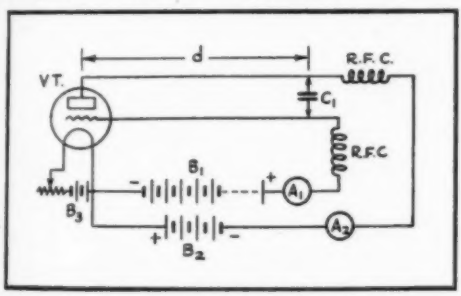


FIG. 3 — THE ESSENTIALS OF THE BARKHAUSEN-KURZ AND GILL-MORRELL OSCILLATOR CIRCUITS

The grid of the triode is connected to the positive of B_1 and the plate to the negative of B_2. B_3 is the filament heating battery. Either B-K or G-M oscillation may be obtained by tuning of the circuit, accomplished by adjusting the "bridge" along the parallel wires.

BARKHAUSEN-KURZ; GILL-MORRELL OSCILLATORS

Experiments with tubes having cylindrical electrodes and a tuned circuit between plate and grid, as in Fig. 3, have shown this to be the most satisfactory arrangement for the production of useful power although the oscillation does not seem always to be of the strictly Barkhausen variety because the tuned circuit can take control of the frequency of oscillation. This leads us to the Gill-Morrell oscillator which is identical in arrangement to the B-K set-up but which behaves in a decidedly different manner. *The frequency of oscillation becomes practically independent of the electrode voltages and is governed by the constants of the oscillatory circuit.* This seems a little confusing but as explained by Hollmann [3] it is possible to obtain a transition from B-K to G-M oscillation with the same set-up simply by changing the operating conditions, as by moving the short-circuiting link along the parallel wires. These oscillations are of the electron variety but (quoting from Hollmann) "are due to the alternating potentials induced in the oscillation circuit and superimposed on the d.c. potentials of the electrodes. An alternating field of the frequency of the oscillations is thus superposed upon the stationary retarding field and results in an electron movement differing from the pure Barkhausen-Kurz oscillations." Oscillations of the G-M variety generally have the greater intensity and occur at a higher frequency than the B-K oscillations for the same electrode potentials. Using special tubes which had the oscillatory circuit within the glass envelope, Hollmann reports obtaining pure B-K oscillations of 21.4-cm. wavelength and states that, "accordingly, with a proper tuning system Gill-Morrell oscillations down to 15 cm. might be obtained with safety."

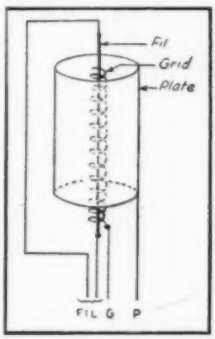


FIG. 4 — TRIODES HAVING CONCENTRIC CYLINDRICAL ELEMENTS ARE MOST SUITABLE FOR B-K G-M OSCILLATORS

Commercially available types are suggested in the text.

Incidentally, it seems to be possible to obtain both types of oscillation simultaneously although the "maxima of the Gill and Morrell oscillations mask the far weaker Barkhausen-Kurz oscillations" at these points, according to Hollmann.

Tubes have cylindrical elements with the plate, grid, and filament coaxial (Fig. 4) seem to be the most satisfactory. Japanese experimenters have found Type '99 tubes suitable [4] and it is known that the old war-time VT-14 or CG-1162 tubes

[3] Hollmann, "Electron Oscillations in a Triode," *Proc. I.R.E.*, Feb., 1929. This paper is especially useful because of its explanation of the fundamentals involved in B-K and G-M oscillations.

[4] Uda, "Radiotelegraphy and Radiotelephony on Half-Meter Waves," *Proc. I.R.E.*, June, 1930. This paper gives a quantity of practical information on electron type transmitters and receivers.

also work.[5] It has been found also that the modern heater Type '27 is suitable [6] and the '37 might also be useful since it has this type of construction. Anyone happening to have some of the old "French" tubes, smuggled back after the War, might find them satisfactory.

Fig. 5 shows a suggested transmitter arrangement after Uda,[4] the Japanese experimenter. Two or more tubes in parallel have been used successfully by him to obtain greater output,

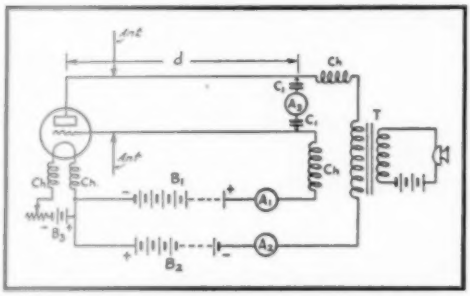


FIG. 5 — THE PRACTICAL B-K G-M CIRCUIT FOR TRANSMITTING MODULATED SIGNALS

For a CG 1162 or VT 14 tube the plate voltage may be −30 volts or less and the grid voltage between 135 and 180 volts. For a Type '27 the negative plate voltage may be but a few volts and the grid voltage about 60 volts. It is possible that a.c. filament supply and filtered r.a.c. plate supply would be satisfactory. Stable oscillation should be approached by tuning the parallel wire circuit from higher to lower frequency; that is, by moving the bridge from the tube terminals towards the ends of the wires. Maximum intensity of oscillation is indicated by maximum reading of the plate milliammeter A_2. Suggested values for the components are as follows:

A_1 — 0–50 milliammeter.
A_2 — 0–1 milliammeter.
A_3 — R.f. ammeter, 0–100 ma. or 0–½ amp.
Ch — R.f. chokes. About 45 turns on 1-inch diameter, spaced. No definite specifications can be given but almost anything can be tried.
T — Microphone transformer.
The length of the parallel wires, d, can be about 10 inches (25 cm.) for wavelengths of around 75 cm., but will depend somewhat on tube used.

with the additional tube capacities showing negligible effects. The grid voltage appears to be important in determining the frequency for B-K oscillations (the higher the voltage the higher the frequency), and in determining the intensity of oscillation at a frequency set by the tuning of the parallel wires for G-M oscillations. Usual values of grid current seem to be 20 to 30 ma. for a grid voltage of about 180 and a negative plate voltage of 30 volts or less. The plate current may be a fraction of a milliampere when the circuit is oscillating, maximum plate current indicating maximum intensity of oscillation, an abrupt change in this current indicating that things have started to happen. Warning: Do not switch off the grid voltage and leave the filament on with the plate circuit closed. If the plate voltage is zero or but slightly negative the usual filament-plate electron current may damage the low-range plate milliammeter.

The parallel-wire tuning system should be "low-loss" and if supported by insulators they should be of good dielectric material, such as paraffined wood, glazed porcelain, etc. Copper or brass rods or tubing would do for the conductors. For a frequency of 400 mc. (75-cm. band) a length of about 20 inches (about 50 cm.) should be sufficient. The bridge (condensers and r.f. meter) should be adjustable along the parallel wires for tuning. The preliminary tuning up and playing with the rig should be done with no radiating system, of course, the r.f. meter and plate meter being watched for indications of oscillation. The r.f. current indicated by A_3 is not likely to be very great, perhaps not more than 100 ma. But then one might be lucky and get enough to burn out a meter. (If you are that lucky it should be worth a good meter.) The wavelength can be measured with a Lecher wire system like that of Fig. 6 or one of the new General Radio 50- to 100-cm. wavemeters can be used.[6] When things are going properly, modulation will be in order. Either the simple modulation scheme shown in Fig. 5 might be used or a speech amplifier can be cut in, the microphone transformer T being replaced by an ordinary A.F.T. coupled to the output of the speech amplifier. After this much progress has been made, experimenting with the radiating system consisting of the two quarter-wave rods can follow.

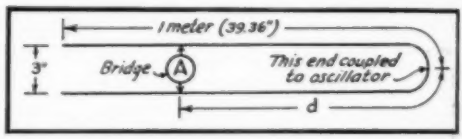


FIG. 6 — LECHER WIRE SYSTEM FOR MEASURING WAVELENGTHS BELOW 2 METERS

It is equivalent to a full-wavelength when tuned to resonance by adjusting the bridge so that maximum current is indicated by the meter A or reaction on the exciting oscillator indicates resonance. The wavelength is taken as twice the distance d, measured in meters or centimeters. As with any absorption wavemeter, the coupling between the Lecher system and the exciting oscillator should be as loose as possible. Measurements are only approximately accurate unless the system is calibrated from a source of known accuracy.

THE RECEIVER

The schematic circuit of a receiver that has been found to be suitable for picking up the signals is shown in Fig. 7. This arrangement is also after Uda,[4] the specifications given under the diagram being taken from his *I.R.E.* paper describing communication by radiotelephony and telegraphy using a similar receiver and a transmitter after the diagram of Fig. 5. Using a direc-

[5] These tubes are now obsolete but a few are still available from the "salvage" stores. They are of the 5-watt type and have a 7.5-volt tungsten filament surrounded by a cylindrical grid and a small cylindrical plate.

[6] Karplus, "Electron Oscillations," *General Radio Experimenter*, May, 1931.

tive transmitting antenna of the Yagi type[7] and a similar receiving antenna, phone communication over a distance of 10 kilometers (6.2 miles) and telegraph communication over a distance of 30 kilometers (18.6 miles) have been successful, according to the above mentioned paper.

The receiver is almost identical with the transmitter except that a potentiometer has been added to control the grid voltage and a variable condenser has been inserted in the bridge of the tuned circuit. Tuning over a wavelength range of from 40 to 80 cm. has been accomplished with a single receiver by adjustment of these two controls. In operation the receiver has an apparent regenerative effect and Uda's description of its action might lead one to suspect a form of super-regeneration as well. Because of the relatively poor frequency stability of both transmitters and receivers of the electron type, only modulated signals are practicable. Beat note c.w. reception is out of the question.

This sketchy outline should enable the competent experimenter to get an idea of the fundamentals of B-K and G-M transmitters and receivers. More complete information for the practical amateur will be published in *QST* as it becomes available. In the meantime, it is suggested that the *Proc. I.R.E.* references given in the footnotes be studied and it is urged that

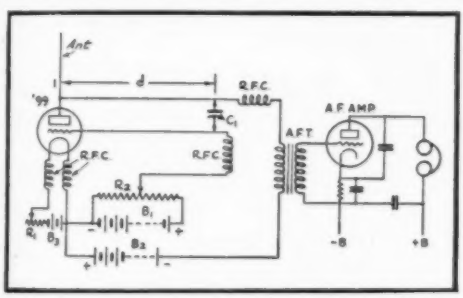


FIG. 7 — SCHEMATIC CIRCUIT OF B-K G-M RECEIVER

It is similar to the transmitter except that a variable condenser in the bridge and a potentiometer on the grid battery are used for tuning. A Type '99 or '27 tube might be used. Voltages will correspond to those for the Type '27 as a transmitting oscillator. The tuning condenser C1 can be of the single- or double-stator type having an effective maximum capacity of about 250 μμfd. or less.

reports on practical results be sent in to *QST*. But we must leave this fascinating phase of ultra-high frequency activity for the present and get back to the more familiar but no less interesting frequencies below 300 megacycles.

REGENERATIVE OSCILLATORS

Pages and pages in *QST* as well as in other publications have been devoted to descriptions of "5-meter" oscillators utilizing every circuit known to the game; so it must be that our contribution to the fund of information is made with a frank acknowledgement that what we have to report is not in any sense something revolutionary or actually new but is more properly modification, with some improvement in performance, of self controlled regenerative transmitters for frequencies in the lower quasi-optical region. We have borrowed generously of the information made available in years past by such pioneers as Kruse, Phelps, Reinartz, Hoffman, West, Douglas, Santangeli, Long, and a host of others. Space does not permit individual division of credit for the various ideas that we have made use of but those familiar with amateur pioneering in the ultra-high frequencies will recognize the features identified with their sponsors.

As it has been said often enough, almost any transmitter circuit will operate at a frequency of 56-mc. or even higher and it is true that almost all of them have been made to oscillate more or less satisfactorily in the 56-mc. region at least. But it cannot be denied that some arrangements do the job more satisfactorily than others, some more dependably than others, and a few with better dependability and frequency stability than the rest. Now the qualifications of dependability and frequency stability are generally coincidental, in our experience, and the arrangement having the best possible frequency stability is the one we are after.

But why worry about frequency stability in the 56-mc. band? Because there isn't any QRM problem there as yet should not anything that works at all be good enough? Far from it. The best obtainable stability at any frequency is none too good. And this is particularly so at the ultra-high frequencies. Without it there can never be any hope of beat-note c.w. reception or of the highest quality phone transmission. And although there may be no genuine QRM problem on the ultra-high frequencies at present, it is coming as surely as this summer's QRN. True, it may never be anything more than purely local in character; but it certainly can be more troublesome with fewer signals to cause it, because frequency stability is largely a matter of percentages. Although a signal may wabble around but 1 part in 35,000 at 3500 kc. (100 cycles) and sound like "pure d.c.," the same proportionate wabble at 56 mc. would be 1600 cycles, taking up 16 times as much space and sounding like "hash." It is acknowledged that it has not been possible with the oscillators described here to obtain a carrier so perfectly stable as to sound like crystal control; but even when using a.c. filament supply and filtered r.a.c. plate power it has been possible to obtain something sounding like "near d.c." and having a degree of stability good enough for beat-note reception with a rigid radiating system and a reasonably stable heterodyne in the

[7] Yagi, "Beam Transmission of Ultra-Short Waves," *Proc. I.R.E.*, June, 1928. This paper describes a type of antenna using "directors" and also describes Barkhausen oscillators of the magnetron type in which a diode (two-element tube) is operated in a strong magnetic field.

receiver. On voice and modulated c.w. the carrier is completely free of objectionable hum (although the frequency modulation cannot be other than plentiful) and the quality is comparable with that obtained with a 3500-kc. crystal-controlled transmitter utilizing the same modulating equipment.

But this cannot be considered the ultimate limit in frequency stability at these frequencies, good though it may seem, because it is still liable to those influences which threaten the performance of any self-excited transmitter coupled to a relatively unstable antenna system and modulated for phone or telegraph transmission. The good qualities possessed by oscillator-amplifier type transmitters are just as essential for these frequencies as for the lower frequencies and there is no reason why they cannot be made entirely practicable. Amateur transmitters of the crystal-controlled type have already proved their worth at 56 mc. and indications are that crystal control will be the standard in commercial designs.

PRELIMINARY 56-MC. EXPERIMENTS

In the course of investigating various oscillators practically all of the "standard" circuits were given a trial. It soon became obvious that to obtain a reasonable degree of efficiency and

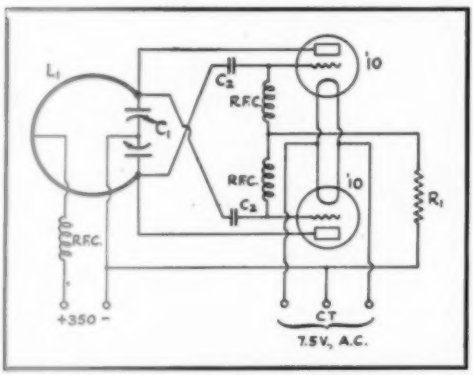


FIG. 8 — THE FIRST MARKED IMPROVEMENT IN PERFORMANCE RESULTED WITH THIS CIRCUIT

Grids and plates are all coupled to the one tank circuit, however, and this was found objectionable. The grid coupling condensers, C_2, ought to be adjustable. 100-$\mu\mu$fd. midgets were used. If the condensers are of the same capacity as the grid-plate tube capacities the circuit becomes neutralized and refuses to oscillate! The remaining components have the same values as in Fig. 9.

frequency stability there were some circuits having inherent features that gave them an unquestionable superiority to the rest. It was found immediately that a push-pull arrangement with a high-C tank was more suitable than a single-ended one, high-C or low-C, checking the results of experiments on oscillators for lower frequencies previously described in *QST*.[8] Moreover, it was found that circuits requiring magnetic coupling between the grid and plate circuits were not so satisfactory as those using capacitive coupling because the tangling up and crossing of grid and plate leads to magnetically coupled coils not only made construction and adjustment a nightmare but also because the stray capacitive and inductive couplings incidental to such circuits made for poor efficiency, a rough carrier, difficult adjustment, and virtually wrecked the frequency stability. Tedious manipulation and futuristic arrangement of the components very probably could reduce these objections but since they were found to be straightened out easily by simpler and more straightforward methods, the long way around was not deemed worth the trial.

[8] Lamb, "Push-Pull Transmitters," *QST*, Dec., 1928; and "Advanced Transmitter Design," *QST*, June, 1930.

MORE STABLE OSCILLATORS

The first marked improvement in performance as judged by reliability, frequency stability, and efficiency, resulted with the circuit shown in Fig. 8. Although this is not a strictly capacitive feed back arrangement (the two halves of the tank circuit could be considered as magnetically coupled to each other with each half acting alternately as the grid coil for one tube and the plate coil for the other) it does eliminate separate grid and plate coils with the objectionable features mentioned above. The plan of the set was identical with that of the low-power outfit shown in the photograph except that the grid condensers C_2 were used instead of the grid coil shown in the illustration. This circuit exhibited two objectionable features, however. One was that the grid condensers were somewhat critical as to capacity, making it advisable to have them adjustable, and the other was that the tying of all the tube capacities to the one tuned circuit had the effect of reducing the amount of lumped tuning capacity that could be used for a given frequency.

Since to realize the utmost from the high-C feature it is unquestionably necessary to minimize the tube capacity affecting the tuned circuit and maximize the lumped tuning capacity as much as reasonably possible, this circuit was rejected in favor of that shown in Fig. 9. This will be recognized as the increasingly popular "TNT" arrangement sponsored by Director Woodruff and used in several lower-frequency transmitters that have been described in *QST*. The plate circuit is relatively high-C, tuned by the condenser C_1, and the grid circuit is "fixed-tune" consisting of the inductance L_2 in parallel with the tube input capacities only; and these are in series. The feed-back is solely through the interelectrode plate-grid coupling within the tubes and, once the grid coil has been adjusted, is of optimum value for satisfactory oscillation over a frequency range well in excess of that necessary to cover the 56-mc. band.

The plate tank circuit is completely symmetrical, the inductance being tapped at the center for

d.c. plate feed and the tuning condenser being of the double-stator type. This type of tank condenser contributes several commendable features, as has been pointed out in a previous article describing a higher powered transmitter.[5] The rotor is completely "cold" at both r.f. and d.c. potentials and may be grounded. Hand capacity affecting the frequency is practically nil when the dial is touched during tuning adjustments and the transmitter can be set to beat

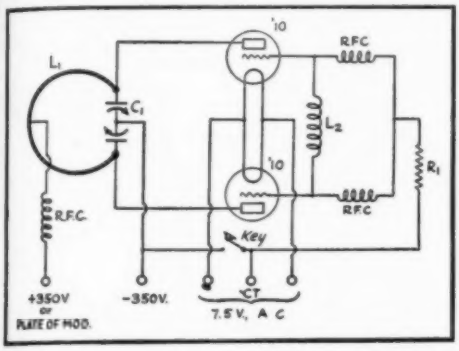


FIG. 9 — THE FINALLY ADOPTED CIRCUIT

It is a push-pull Armstrong with fixed grid coil — better known as the TNT circuit.

L_1 — Single turn of ¼-inch copper tubing, 4 inches in diameter, mounted on stator terminals of tank condenser.

L_2 — 4 turns No. 14 enameled antenna wire, 1" in diameter, and about 2" in length. Turns are squeezed together or separated until set oscillates with minimum plate current at maximum capacity setting of plate tank condenser.

C_1 — Cardwell tapered-plate condenser, 2 sections, 3 plates in each section. Net maximum capacity (sections in series) about 40 μμfd. For modulated transmission spacing between rotor and stator plates should be increased slightly, to raise breakdown voltage rating, and mall fixed capacity connected in parallel.

RFC — 18 turns of No. 24 d.c.c. on ½-inch wooden dowel, 1/16-inch spacing between turns.

R_1 — 10,000-ohm non-inductive grid-leak, 25-watt size or larger.

with an oscillating monitor or receiver. Moreover, the bearings of the condenser are not in the r.f. tank circuit and the liability of high-resistance contacts at these points is completely eliminated. Further, grounding the rotor makes it possible to by-pass the even harmonics directly to the "neutral" side of the circuit without the necessity for a by-pass from the tank inductance center-tap.

It will be noticed that there are no filament by-pass condensers in this oscillator and that both grid and plate blocking condensers have been omitted. The evil effects of resonant filament circuits and inductive condensers (pointed out in a previous article describing a transmitter of this type) [8] made it advisable to omit them and the performance of the transmitter completely justifies their omission.

The rig shown has shunt connections through r.f. chokes for the grid bias but the alternative series connection shown in Fig. 10 could be used instead. The reason for using the shunt bias connection in this particular set is that the grid chokes were in place when the circuit was changed from that shown in Fig. 8 and since the chokes seemed to be completely effective they were allowed to remain. Their use of course eliminates the necessity for a center tap on the grid coil and also makes the preliminary adjustment of the grid coil less bothersome. Incidentally, it has been agreeably surprising to find the r. f. chokes used in this 56-mc. equipment so completely effective. Although the choke specifications given here may not be satisfactory for every set, there is no doubt that r.f. chokes can be made to "do their stuff" at these frequencies. The r.f. choke in the positive plate lead is not intended so much for stopping r.f. of the fundamental frequency as for stopping the even harmonics which exist in this part of the circuit. The same would apply to the choke in series with the leak in the series bias-feed arrangement of Fig. 10.

In laying out and wiring the set there are a few precautions that should be observed. Since there is a "neutral field" along a line passing between the tubes from the grid to plate end of the assembly as laid out in this oscillator, the zero r.f. potential leads between the condenser rotor and leak and to the sources of supply should be kept in this neutral area as much as possible. This applies particularly to the filament leads. They should be connected to the midpoints of the busses between the filament terminals and brought out at the grid end of the assembly. The use of a twisted pair for these leads is also advisable. It is obvious that any r.f. picked up in an unbalanced filament circuit will be modulated by the alternating filament current and probably affect the quality and frequency stability of the carrier. A test comparison of a.c. and d.c. filament supply showed that the output of this oscillator was not in any way affected by a.c. filament supply.

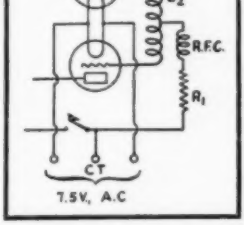


FIG. 10 — CONNECTION FOR SERIES GRID BIAS ELIMINATING SHUNTING CHOKES

SUITABLE TUBES

Although this set is designed particularly for Type '10 tubes having thoriated filaments, other tubes having suitable characteristics could be used with but slight modifications in the circuit constants. Type '27 tubes might be used in a lower powered set with the usual filament and cathode connections, for instance, or Type '01-A or '12-A tubes might be used in a set intended for battery operation. In any case, the plate voltage should be kept well below the values that are

customary at the lower frequencies, for it must be remembered that the strain on the tube insulation is much greater at the ultra-high frequencies and that the limit on what a tube can handle becomes not what it can dissipate on the plate but what the dielectric breakdown in its stem may be. As an interesting instance of this, we were successful in puncturing the stem of a pet '10 at 70 mc. (this set goes up there with the tank condenser near minimum) by the simple process of raising the plate voltage from 350 to 550 volts and letting the oscillator run unloaded for about 10 minutes. And the plate was stone black when a warning sigh (it was literally that) called our attention to the fact that something had happened. Oscillation ceased immediately, of course, and the filament stayed lighted for about a minute after the plate power had been switched off. Then it collapsed. The tube had simply sprung a leak through a break in the seal caused by failure of the glass as a result of dielectric breakdown. This sort of failure is most likely to occur when the oscillator is running without an antenna or other load coupled to its output and is particularly pernicious in low-*C* circuits, especially those of the single-ended type. When tube capacities become large in relation to the capacity shunting them the proportion of the tank current through the tube becomes greater and hence the dielectric heating of the tube increases — another reason for high-*C* push-pull circuits in regenerative oscillators at the ultra-high frequencies. Incidentally, tubes having oxide coated filaments are likely to give some trouble. Tests on a few sample Type '45's indicated that their grids had a leaning towards becoming emitters of electrons and wanted to go positive after a few minutes' operation. This was at a plate voltage of 350, however, and might not be serious if the plate voltage were considerably lower. Tubes having straight tungsten or thoriated tungsten filaments are preferable for oscillators operating at plate voltages over 300. Commercially available tubes of the medium and high-impedance types appear to have the most desirable characteristics and those having inter-electrode capacities no greater than those of the Type '10 are to be favored. Screen-grid tubes are not very well suited to oscillator use although they have possibilities as power amplifiers in oscillator-amplifier transmitters.

Type '52 tubes were used in the hurriedly assembled experimental set that was built up to get an idea of the relative merits of high and low power at 56 mc. and needless to say that they showed their intended qualifications for ultra-high frequency work. This set is shown in an illustration and its schematic circuit is given in Fig. 11. Everything in the set is visible on top of the baseboard so no further detailed description should be necessary. The arrangement of the parts is based on the same principles as were explained in connection with the low-power rig.

FINDING THE BAND

Although the 56-mc. band is a good many kilocycles removed from the other amateur bands, it is still in harmonic relation to the rest and this facilitates locating the transmitter tuning within the band limits. In the preliminary cut-and-try period of getting the set to oscillate properly somewhere near the "5-meter" region, an absorption or reaction type wavemeter or frequency meter is handy. Not many commercial models come with a 56-mc. coil and calibration (the General Radio Type 558-P is one that does) and it is improbable that many amateur-built wavemeters are calibrated for this band. In using an absorption type meter to make an approximate check on the frequency it should be coupled to the transmitter tank circuit just enough to cause a slight kick in the plate milliammeter reading at resonance — and no closer. A wavemeter "resonance indicating" lamp (neon or

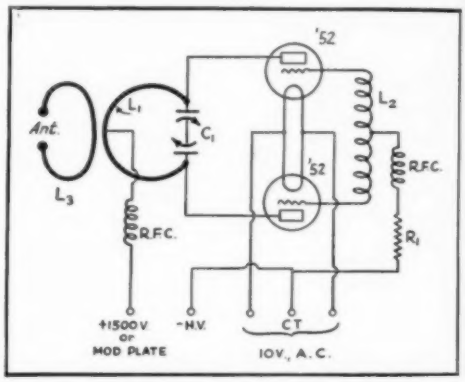


FIG. 11 — CIRCUIT OF THE HIGH-POWER TRANSMITTER

L_1 — 4/5 turn of ¼-inch copper tubing, 3" diameter, ends flattened and drilled for mounting on porcelain wall-type insulators.

L_2 — 11 turns of No. 14 enameled antenna wire, 1-inch diameter, about 1/8-inch spacing between turns. Supported by lug soldered to center turn and screwed to top of 5/8-inch wooden dowel which is 8 inches high.

L_3 — Antenna coupling coil, 3-inch inside diameter, pivoted on machine screws through brass angles mounted on wall-type insulators.

C_1 — Remodeled National Type TM 450 transmitting condenser. Split into 2 sections each having 9 rotor and 9 stator plates.

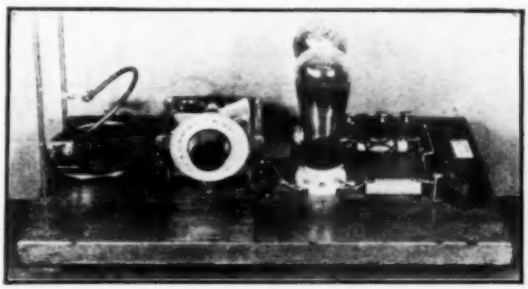
RFC — Same as in Fig. 9.

R_1 — 20,000-ohm non-inductive grid leak, 100-watt size. Higher resistance may be used.

filament type) cannot be trusted for even approximate frequency measurement except with a high-power oscillator because the coupling necessary to light the lamp is too great. A sensitive thermo-couple or equivalent indicating device may not be so bad. In any case the absorption type method of direct measurement can be no more than roughly approximate — it is no

better at 56 mc. than it is at the lower amateur frequencies — and a heterodyne meter like the dynatron, calibrated for the lower-frequency amateur bands, is far more accurate and dependable. In addition, the process of getting 56-mc. calibrations from it is much simpler than the long jump in kilocycles would lead one to believe. Here is the way to do it:

Put the receiver on the 14-mc. band and tune it to a frequency between 14,000 and 15,000 kc. by beating the detector oscillation against the proper harmonic of the frequency meter, say the fourth harmonic of a 3500-kc. dynatron. The detector should be oscillating vigorously with the regeneration control pushed almost to the point where squealing starts, assuming that you have one of those squealing detectors. This will make the detector generate plentiful harmonics, especially the fourth which we are going to use.



THE LOW-POWER 56-MC. TRANSMITTER USED IN THE TESTS

Push-pull and high-C are largely responsible for its stability. The antenna coupling system includes the half-turn loop and the vertical brass rods on which it is mounted. Tuning of the feeder system is accomplished by adjusting the feeder clips along the brass rods.

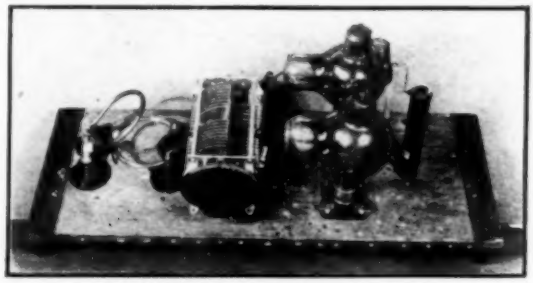
Now start up the 56-mc. oscillator and tune the tank circuit carefully, starting from maximum capacity and going up in frequency. Do this slowly and listen for signs of a fairly loud signal in the phones or speaker, disregarding any weaker ones. When you find it, tune the oscillator "right on the nose" and make a record of the dial setting. If everything is according to Hoyle this should be near the maximum capacity setting of the tank condenser (for a duplicate of the low-power set that has been described), probably between "90" and "100" for 56,000 kc., and you are beating the fundamental frequency of the 56-mc. oscillator against the fourth harmonic of the receiver. Of course it is possible that the oscillator frequency might be some harmonic other than the fourth of the oscillating detector, or that a harmonic of the oscillator might be beating with a harmonic of the receiver. The first possibility might be probable but the second is very remote providing the oscillator setting chosen was that for the loudest signal. The harmonics of the transmitter will be so weak in comparison to the fundamental that there is little danger of making this mistake.

Now there are several ways to check whether the oscillator frequency is the fourth or some other harmonic of the receiver, the most direct being to go looking for the ones on either side of it. Using coils that cover a little more than just the amateur bands, the receiver can be tuned to a frequency whose fifth harmonic is the same as the fourth of the one in the 14-mc. band (this would be 11,200 kc. for 56,000 kc., the fourth harmonic of 14,000 kc.) or to a frequency whose third harmonic coincides with the fourth of the 14-mc. band frequency (this would be 18,666 kc. for 56,000 kc.). It happens that the 3500-kc. band frequency meter can be used to spot the 11,200- and 18,666-kc. points on the receiver, too. Without splitting kilocycles, 11,200 kc. is the third harmonic of 3733 kc. and 18,666 kc. is the fifth harmonic of 3733 kc. Here is an opportunity to get some work out of those loafing odd harmonics of ham-band frequency meters. If the oscillator setting is right the signal should be found at both of these "straddle" points. Another method is to tune the receiver to the 7000-kc. band, exactly to the frequency which is half that of the 14-mc. setting, and find the 56-mc. signal beating against the eighth harmonic of the strongly oscillating detector. We have used both of these methods and have found them to work to a "T." All this may look like a cross-word puzzle or one of those "if 3 men can dig a ditch in 2 days" problems, but don't let that scare you. The step-by-step doing of the thing is a straightforward and interesting procedure despite the confusing appearance and dullness it may seem to have as reading material. Give it a trial and get a liberal education in higher frequency measurement!

ANTENNA SYSTEMS AND COMMUNICATION TESTS

After all this conglomeration of detail had been collected, it would seem to be high time that some practical use was made of it. We reached the same state of mind and the completion of Ross Hull's super-regen receiver, which he describes in this issue, started activities with a bang. Although a casual visitor might have jumped to the conclusion that Ross, George Grammer, Clark Rodimon, and one Jim Lamb were become but so many candidates for the State Hospital (a Connecticut institution that harbors people who get that way) there still remained a modicum of rhyme and reason to the program. The low-power oscillator was rigged and made ready for the modulated transmission necessary for reception with the super-regenerative receiver, by adding to it the *Handbook* speech amplifier and modulator

designed to handle a pair of Type '10 Class-C amplifiers. This unit has two stages of speech amplification using Type '27 tubes and swinging the grids of a pair of paralleled Type '50's serving as modulators. The plate voltage on the '50's was 500 and this was dropped to 325 by the time the 70-ma. plate current to the Type '10's got through the 2500-ohm plate dropping resistor connected between the modulator plates and the "plus high voltage" terminal on the 56-mc. oscillator. Of course this arrangement represented quite a come-down for the modulator unit since it was originally designed and used to work into nothing less than a genuine Class-C r.f. power amplifier having at least one buffer stage between it and the oscillator. But 56-mc. development needs a little further exploration before oscillator-amplifier phone technique teaches the practical status it has attained in the 3500- and 14,000-kc. phone bands, so that modulation of an oscillator (and 100% modulation at that) was excusable in this case. Be it said, however, that this equipment never has and never will be used to modulate an oscillator at any lower frequency! That would be inexcusable.



THE HIGH-POWER OSCILLATOR
This was modulated by a UV-849 for phone transmission.

With the "inside plant" equipment thoroughly checked and ready for business, the next necessity was a radiating system. A number of antenna designs to test various theories had been prepared in previous stages of the ultra-high frequency program (the work is following a planned course that started last fall, by the way) and one of the basic classifications in these designs is that of high-angle versus low-angle radiators. A second classification is that of horizontal versus vertical polarization. Now it happened that a 28-mc. band directive system was available on the roof at the time and that this rig could be readily modified to transmit 56-mc. waves at high angles of radiation with both types of polarization simultaneously. The natural expectation was that the combination of these two characteristics, high-angle radiation and "cross" polarization, would show something interesting, at least in the negative sense; for only low-angle radiation (the "ground wave") and polarization in but one plane (preferably the vertical) are thought desirable at the ultra-high frequencies where "sky-wave" signals that depend on reflection from the Heavyside layer are, to all practical purposes, non-existant.

The essentials of the radiating system are shown schematically in Fig. 12-A. Each element is 2/2 wavelength for the 56-mc. band and the two are at right angles. The vertical full-wave section by itself is theoretically a high-angle radiator,[10] giving polarization in the vertical plane. The horizontal full-wave section is also a high angle radiator[9] giving the waves polarization in the horizontal plane. The result of the combination of these characteristics — well, you can do your own guessing. We tried actual experiment instead. The tuned two-wire feeder system was essentially Zepp (voltage) feed to the two full-wave Hertz antennas in parallel, the current distribution and direction of flow being something like the curves and arrows indicated in Fig. 12-B. The feeder wires happened to be a little less than 9/4 wave in length but tuning to resonance was accomplished easily by adjusting the feeder connections along the parallel rods that are part of the antenna coupling system of the low-power set.

In the meantime Ross had been equipping his car for the field tests with the super-regenerative receiver and the two jobs were completed almost simultaneously. Preliminary trials with the car almost under the transmitting antenna showed that everything was working satisfactorily; so Ross and I hopped and away we started.

Everything was fine for about five blocks. Then the voice of George Grammer, who was handling the transmitter, began to rise and fall in volume as if the antenna were swinging in a sixty-mile gale. But slowing down the speed of the car or making it faster changed the rate of the fading accordingly; stopping the car at a point where the signal was completely out and going ahead or backing up a few feet brought the signal back to R9 level. Clearly there were nodes and loops of field intensity as we traveled along. Something was causing violent interference patterns in the field. Continued cruising in different directions and at distances up to 5 miles or so from the transmitter showed that this phenomenon was the general rule. The complex characteristics of the radiating system were suspected immediately so back we went to make what appeared to be the necessary corrections.

The second antenna system is that shown in Fig. 13-A. This theoretically provides low-angle radiation [10] and vertical polarization. The current

[9] Clapp and Chinn, "Directional Properties of Transmitting and Receiving Antennae," *QST*, March, 1928.
[10] Rice, "Short-Wave Radio Transmission and Its Practical Uses," Part 2, *QST*, Aug., 1927.

distribution and direction of flow at a particular instant are shown in Fig. 13-B. The two half-wave antennas are excited in phase with the result that the radiation is concentrated in a plane at right angles to the axis of the wires. Since the antennas are both vertical, one above the other, the polarization of the waves also is vertical. When this system had been completed and tuned to resonance with the transmitter, a second field trip was made over the same route as the first one. Except for a few exceptions, the standing waves had almost disappeared and the average signal level was considerably higher than with the hybrid antenna system. This was according to expectations and checked with the theory. The "standing waves" still remaining cropped up over but short stretches and might be attributed to "accidental" phase shifts in the vicinity of the transmitting or receiving antenna as a result of re-radiation from conductors such as smoke-stack guys, power and telephone lines, lightning rods, BCL antennas, wire fences, and perhaps even rocks and trees. We hope to be able to run down some of the possible causes of these interference patterns in future experiments to that end but our expectations of isolating them are none too sanguine. The average of a number of observations should be valuable in finding out something about this interference pattern business and it is suggested that other experimenters observe and record for *QST* conditions where these "standing wave" effects are encountered.

In subsequent tests, particularly the 35-mile northward run described by Ross Hull, reflector antennas were added on the south side of the non-directional system of Fig. 13, as shown in Fig. 14. It has not been possible to make anything like a comprehensive comparison between the performance with this antenna and the non-directive system at the time of this writing, because of lack of time, but test runs have indicated that there is a marked reduction in radiation toward the south and perhaps a slight gain towards the north. An accurate indication of the gain would require more precise methods than the aural measurements used in these preliminary tests.

A hurried comparison of the relative merits of high and low power, made by substituting the oscillator using the Type '52 tubes for the low-power set, modulated by an 849, indicated that there was a slight increase in the average signal strength with the increased power but that the increase was not proportional to the relative cost of the two outfits. It is probable, however, that the higher power would be effective in pushing useful signals into spots that are just out of range with the lower power. Power ratio in itself is not a true index of relative usefulness anyway, as pointed out in the "decibel" article in a forthcoming issue.

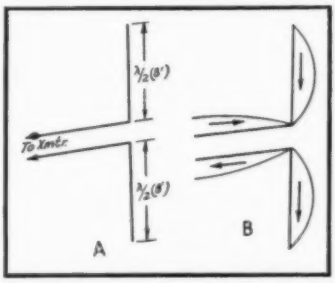


FIG. 13—THE LOW-ANGLE RADIATOR GIVING VERTICAL POLARIZATION

In the later tests made with the two transmitters, it was found that a continuous tone of constant amplitude was more useful than voice modulation in gauging the performance of the signals and an audio-frequency dynatron oscillator using a '24 tube was substituted for the microphone. This modification made sudden fluctuations in signal strength more noticeable when the test car was in motion.

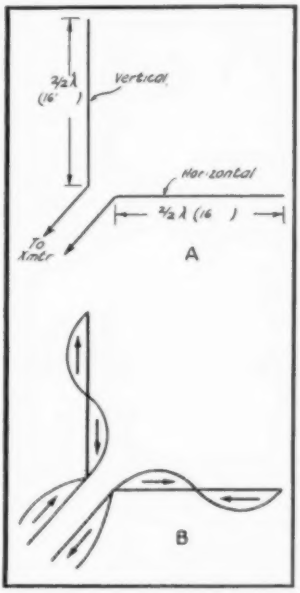


FIG. 12—THIS ANTENNA SYSTEM GAVE HIGH-ANGLE RADIATION WITH BOTH HORIZONTAL AND VERTICAL POLARIZATION

FUTURE DEVELOPMENTS

The sketchy investigation of the performance of 56-mc. signals made so far does not warrant anything like conclusive predictions as to what may be expected under any and all, or even "average," conditions. It is obvious that the useful range is considerably in excess of what might be called "sight" range, for instance, and solid obstructions in the path of the signals show erratic capabilities for stopping them. The signals are often found in the most unexpected places and then again are lost entirely in spots where good reception would appear likely. How the signals get over and around such apparently insurmountable obstructions as high hills and show up in the valley on the other side without the assistance of reflection or refraction in the atmosphere is just one of the things that intrigues us.

Amateurs can do a lot towards the solution of such puzzles by making careful records of what their investigations show and by sending written reports on their findings to A.R.R.L. headquarters for "averaging" and making the information available to the rest of the gang. Until we know more about the behavior of these ultra-high frequencies in our own bailiwicks, it is safe to say that their probable behavior over long distances cannot be intelligently forecast. If it ever should be possible to obtain reliable DX communication at 56-mc., the way to do it is most likely to be discovered after we have reached a thorough understanding of the behavior of the signals in the immediate vicinity of the transmitter.

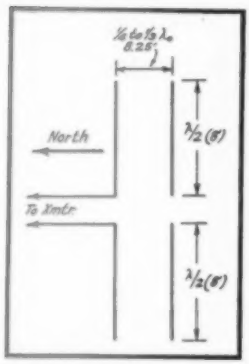


FIG. 14 — REFLECTORS WERE ADDED TO THE NON-DIRECTIVE ANTENNA OF FIG. 13

The New England Division Convention

WITH fair weather conducive to good fellows getting together this year's New England Division Convention, held at the Hotel Bradford, Boston, Mass., on April 24th and 25th, under the auspices of the Eastern Massachusetts Amateur Radio Association, was most successful. A large registration and a programme replete with interesting events made a perfect setting for the official opening Friday afternoon by G. W. Bailey, W1KH, the General Chairman. Almost immediately the stunts committee got busy and saw to it that everyone would have a chance to participate. The first event being the Code Speed contest and one of the finest demonstration of perfect copying by an amateur was made by Frank S. Huddy, W1II, who won the first prize. For a respite F. E. Handy, Communications Manager, A.R.R.L., gave a good talk and then throwing the meeting into forum everyone had a chance to give expression to pertinent matters. The Navy was well represented at the afternoon meeting by Lieut. R. G. McCool, U.S.N., and the naval reserve men as well as others interested in the work. While this was going on, the Army was represented by Major J. C. Platt, Jr., who supervises the First Corps Area Army-Amateur Net, in another session.

The first evening was filled with events and there were no lag in anything — the Fall River Club and the Blackstone Valley Club participating in the Inter-Club Contests; the event being won by the latter club whose orchestra was well worth hearing. During a short intermission, Frank Huddy showed his versatility by giving a very interesting talk on a remote control system which he has developed. The individual stunt contest was won by Dr. J. A. Stewart, W1SK. "Woody" Darrow has not lost his imagination and won the first liar's prize. And then came a very novel stunt — the sending of the alphabet in continental code on a large wooden key with one's foot; the prize winner Hisamoto, K6CLJ, sent perfect code. The evening closed with a skit by the S.N.E. Amateur Radio League of Providence. If reports are true plenty of "hamfesting" was enjoyed until the wee small hours. This did not deter the delegates from assembling early the next morning for trips to the East Boston Airport; Navy Yard, Charlestown; General Radio Company, Cambridge; and Massachusetts Institute of Technology under the able guidance of Hayward, Quinlan, Battison and Elser.

Saturday afternoon the small ballroom on the 15th Floor was crowded and the expectancy of those present was fully justified in the talks given by Prof. E. L. Bowles of M.I.T., Mr. Allan D. MacLeod of Champion Radio Works, Mr. L. S. Fox, National Carbon Co., television demonstration by Mr. Reginald Sherman, W1BJL, and last but not least "Woody" Darrow gave an illustrated lecture based on his Milkatron, which, for humor, could not be improved on.

To complete the two full days came the banquet with its good food and fine music by Signor Pietro Mordelia and Mr. David Lynch, organist. For the first time in the history of New England Division Convention our worthy President, Hiram Percy Maxim, was unable to be present owing to an operation he underwent some few weeks ago, but we had the pleasure of hearing his voice over long distance and loud speakers through the ingenuity of the phone fellows, and his words of greeting were well received. The principal speeches of the evening were made by A. A. Hebert, A.R.R.L. Treasurer, and Fieldman, who reviewed the year's activities and the preparations being made for the Madrid International Conference in 1932; Capt. J. B. Gay, U.S.N., who dwelt on the days when Uncle Sam's ships were without radio as compared with to-day. Major J. C. Platt, Jr., U.S.A., F. E. Handy of A.R.R.L. made some remarks and Supervisor of Radio Kolster brought forcibly to those present what may be expected from the radio division in future for off frequency operation.

Some twenty-seven manufacturers generously donated prizes which were distributed to winners of events and the sincere appreciation of the convention delegates is extended to all who contributed.

Three cheers to Bailey, Weeks, Hannah, Cooley and the other committee members for their efforts in making this convention a success. PROVIDENCE next year.

— *A. A. H.*

"Five Meter" Receiver Progress

Describing a Successful Super-Regenerative Receiver for the Ultra-High Frequencies

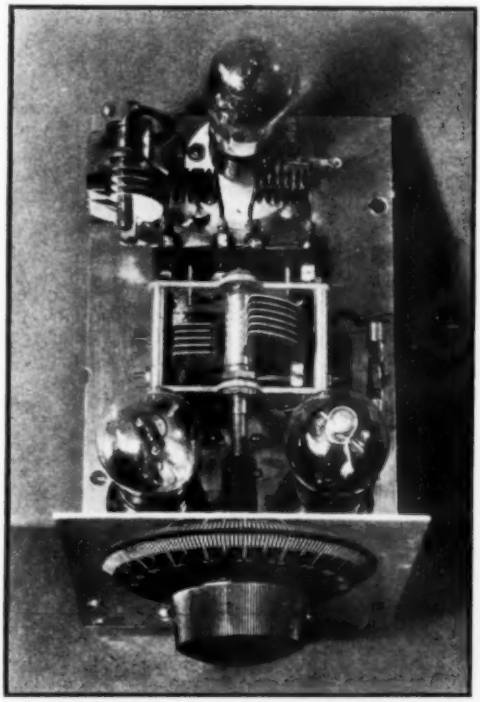
By Ross A. Hull, Associate Editor

A GREAT many notions have had to be modified since the time when amateurs first took an interest in "five-meters." Chief of these is the original idea that, because "20-meters" was a whole lot better than the longer waves for distance work, the five-meter band should be better still. This apparently erroneous presumption led to disappointment when the uselessness of the band for DX work was indicated; and this disappointment, in turn, so thoroughly anesthetized amateur interest in the work that it is only now being revived after two years of dormancy.

As we see it now, it seems that experiment on the frequencies between 56 and 60 megacycles can be just as absorbing as that on any other band if only one's DX ambitions are not allowed to mask the real issue. The band, it appears, is useful exclusively for short-haul work. As such, it represents territory of peculiar and undoubted worth.

The local ultra-high frequency revival (if we may call it that) started out some few months ago when James Lamb cooked up some new equipment and began experiment with it in the laboratory. So successful was it and so intriguing its possibilities that before long all of us were steamed up to the point where only an active interest in the work would appease our appetite. As will probably be reported in Lamb's article, his laboratory work was concerned with the development of simple, practical equipment which would be free from the "craziness" which seems to have been considered characteristic of all 56-mc. apparatus. It was only after the successful attainment of this objective that communication was attempted, during the last two days, outside the laboratory.

The receiver illustrated on these pages was used in the communication tests. It is a hybrid with circuit details borrowed from several of the scores of five-meter receivers which have been described in *QST* since 1926. It has quite high sensitivity, freedom from microphonic noises and a simplicity and effectiveness of adjustment which has made it unnecessary to touch the tuning of the set during an eighty-mile observation trip in an automobile. The reasons for the success of the set lie chiefly in the use of super-regeneration and the new indirectly heated 6-volt "automobile" tubes. Without super-regeneration the set would be insensitive and extremely difficult to tune. Without the indirectly heated tubes it would be noisy when operated in a moving car. These things we know from sad experience.



A PLAN VIEW OF THE SUPER-REGENERATIVE *56 mc. receiver, the chief features of which are extremely high sensitivity, simplicity of tuning control, and an ability to operate reliably in a moving automobile.*

Since super-regeneration plays such an important part in this set and since it has had so little treatment since the original *QST* articles of 1922, it might be well to outline the principle on which it operates. We all know that the sensitivity of a regenerative receiver increases very rapidly as the point of oscillation is approached, but that the point of oscillation constitutes the limit to which this amplification may be carried in the usual receiver. In the super-regenerative sys-

tem the application of an auxiliary super-audible frequency voltage on the grid or plate of the regenerative tube allows relatively terrific regeneration without the paralyzing self-oscillation which would ordinarily occur. In this particular version of the system, the regenerative detector is "plate modulated" by the long-wave oscillator and the detector plate voltage is therefore swinging back and forth at the frequency of that oscillator. On the positive peaks the voltage is of an order which would ordinarily make the detector oscillate violently. Such oscillation has no time to develop, however, before the plate voltage swings down on the next half-cycle of the auxiliary oscillator. Strictly speaking, an oscillation may develop during the positive half cycles but its amplitude is of such a low order as to be of little consequence. Operated in this condition, a regenerative detector may provide amplification many million times greater than that of the simple regenerative detector operated just below oscillation.

The super-regenerative receiver as originally described by Armstrong in 1922 appears at that time to have been considered a "flop" for amateur work (or any other work for that matter). The low ratio between the frequency of the received signals (on 200 meters) and any possible super-audible frequency limited the amplification of the system and caused it to be wretchedly difficult to handle. Since that time the arrangement has been used successfully for reception on the higher frequency amateur bands where the ratio between the received and auxiliary oscillator frequencies is much higher; but it is on the 56 mc. band where super-regeneration really comes into its own. On that band, the possible amplification is very great indeed. All the dizzy squeaks and general irregularities of operation disappear and we are provided with an extremely sensitive receiver, much simpler and more positive in its control than any conceivable autodyne set of the usual type. With the one tuning knob and a regeneration control, the receiver behaves just as if it were an ordinary rig on the 1715-kc. band. As we have said, it has been tuned to a signal just below the point of oscillation and has remained in that condition during an 80-mile ride over more or less rough back-roads. But enough, enough — on super-regeneration at least.

The other important feature of a 56-mc. receiver (perhaps it should have received first mention) is the tuning circuit. For this, almost any amateur could cull from his repertory a half-dozen possible schemes. Probably they would all work but it is certain that some of them would be quite unsuited. On the frequencies with which we are concerned it is obvious that the total amount of inductance in the circuit, even with a low order of capacity, is to be very limited. The leads within the tube itself added to the connecting links to the coil and tuning condenser are likely to represent quite an appreciable proportion of the total inductance necessary. Then, we have the capacity between these leads and between the elements of the tube. It is also to be of great importance in limiting the possible inductance in the coil itself. A preliminary experiment (or computation if you like) soon shows that if we are to connect the tuning condenser across the coil itself the inductance of the coil will have to be kept very low if we are to reach 60 mc. (the high-frequency end of the band). With a tuning condenser having a low minimum capacity and a low capacity range, the scheme could be used with satisfaction — and has — but there are much more interesting possibilities in that group of tuning circuits in which the tuning condenser is in series with the coil and the capacity between the two elements of the tube to which the tuned circuit is connected. By using this scheme, a much lower minimum capacity is obtained and the coil can be made considerably larger than in the parallel-tuned circuits. This, perhaps, is made clearer in Fig. 1. At "A" is shown the usual parallel-tuned circuit with the grid-filament capacity of the tube in parallel with the condenser C_1. At "C" is the series tuned circuit in which, as "D" shows, the grid-filament capacity is in series. Carried into the realm of push-pull we see that at "E" and "F" the tuning condenser and coils could be in series with the two tube capacities also in series, so permitting an even greater increase in the tuning inductance. The push-pull feature could be applied to the shunt tuned system with similar advantage. However, we can hardly digress to discuss all the possible schemes. There are scores of them, all probably having some particular worthwhile characteristic.

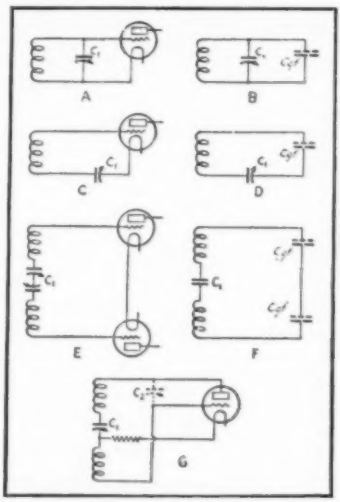
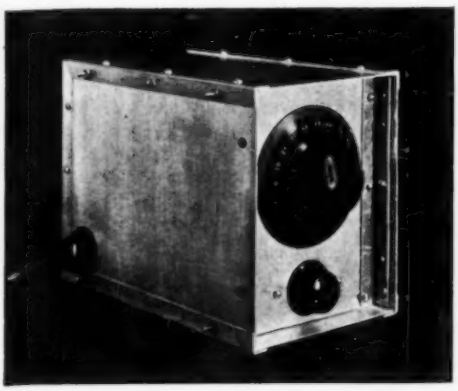


FIG. 1 — SOME POSSIBLE TUNING CIRCUITS

for the 56 mc. receiver. That shown at "F" is incorporated in the receiver described.

The first circuit tried in our bread-board layout was that shown in Fig. 1 at "C." The 56-mc. band could be covered satisfactorily with a practical amount of inductance but with the usual

tickler arrangements we found it very difficult to obtain a similar degree of regeneration across the band without frequent adjustment of the regeneration control. This weakness was not to be tolerated and we detoured, therefore, to see what offered elsewhere. A version of the Hartley used in a 1927 model receiver, described in *QST* by Frank C. Jones, looked promising and it had



THE RECEIVER, AT A LATER STAGE, FITTED WITH BATTERY PLUG AND BOXED UP FOR SOME PROPOSED AIRPLANE TESTS

found a vigorous oscillator in one of the small transmitters. Actually it is the old series or split Hartley of transmitter fame without any shunt condenser across the coil. It oscillated persistently all across the 56-mc. band at the first kick. And for no other reason than that it operated well, we decided to make use of it. It is shown at "G" in Fig. 1. Admittedly, both sides of the tuning condenser were above ground, but experiment soon showed that no troublesome hand capacity effect would be noticed if a metal panel were used with a short insulating coupling between the condenser and dial. A split stator tuning condenser would have constituted a more direct solution to the hand-capacity problem but it would not have been an equally convenient or inexpensive one.

The one disadvantage of such a series-tuned circuit is that the tuning curve is much steeper at the lower end of the scale (where the capacity of the tuning condenser may be of a similar order to that of the tube capacity) than it is at the upper end of the scale. This problem was covered by the very simple though certainly crude process of adjusting the circuit so that the 56- to 60-mc. band occupied about 50 degrees of the dial near its upper end.

To allow a precise placement of the band on the main tuning dial without the necessity of fiddling with coils the condenser C_2 was found a convenience. It is a 15 $\mu\mu$fd. Cardwell "Balancet" fitted with the locking device featured on that particular condenser. It is not an essential fitment but it certainly is a useful one. It is, of course, so mounted as to be insulated from the metal base. C_3 is the usual antenna coupling condenser. It consists of two aluminum plates $\frac{3}{8}$ in. by $\frac{1}{2}$ in. spaced about $\frac{1}{16}$ in. and fitted to the grid terminal of the detector tube socket.

Much experiment on the bread-board with other circuit details resulted in the final arrangement shown in Fig. 2. Let us review it.

The upper tube is the detector — Type '37 of the new series of indirectly heated 6-volt battery type tubes. Its own private circuit corresponds to that of "F" in Fig. 1 — a series-tuned series-feed Hartley. L_1 and L_2, the two sections of the inductance each have 7 turns $\frac{3}{8}$" inside diameter. (We visualized the enormous voltages building up across such a high-L circuit!) The main tuning condenser C_1 is of 105 $\mu\mu$fd. maximum capacity and for it one of the new Cardwell Type 404B was used. R_1 is the grid-leak used to complete the grid circuit and to maintain the grid at a satisfactory operating voltage. In the plate circuit of this tube we have the usual radio frequency choke, the primary of the audio transformer (with a large by-pass condenser) and the regeneration control resistor R_2. This, of course, is by-passed, the condenser being large enough to keep the resistor quiet in operation.

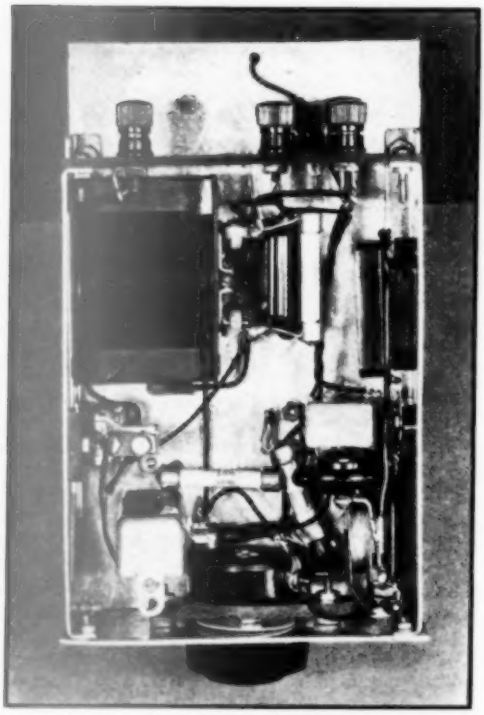
The low-frequency auxiliary oscillator comprises the tube at the left of the diagram, the inductances L_3, L_4, and the associated condensers. Examination of the wiring will show that this oscillator unit is connected to the detector unit in just the same way as a modulator would be connected to a modulated amplifier for plate modulation — L_3 being the equivalent of the speech choke. The tube used for this oscillator is the same (Type '37) as the detector. A Type '36 screen-grid tube was tried in this position (a variable screen voltage being used to control the amplitude of oscillation) but no advantage was indicated. Maximum sensitivity was obtained with the oscillator pumping its hardest.

The circuit of the Type '38 pentode audio amplifier tube is quite conventional. Bias is obtained, as in the oscillator, with a resistor in the plate return to the cathode. A resistor R_4 across the secondary of the audio transformer serves to eliminate any tendency towards "fringe howl." The main idea in the planning of the circuit was to eliminate as many variable elements as possible, to make the set operative from just a single 45-volt "B" battery, and to make the whole thing absolutely "sure-fire" in operation.

The make-up of the final set is shown in the two photographs. Its main-frame is composed of an aluminum panel 5 in. by 7 in. attached to a base 5 in. by 8 in. with two Benjamin brackets. These brackets allow a space 2 inches high under the base in which the components of auxiliary oscillator and the audio amplifier are housed.

The upper surface of the base is reserved for the tuning circuit of the detector and the three tubes.

In the plan view of the set, the detector can be seen at the rear center of the base. It sits in a General Radio Isolantite UY type socket. A bakelite socket would, of course, serve the purpose. On the left rear corner of the base is the "band-setting" condenser C_2. Once adjusted to give the desired band-coverage it is left untouched. The condenser in the center of the base obviously is the main tuning condenser C_1. Since both stator and rotor are above ground potential it is not mounted to the base with the usual metal brackets. Instead, it is mounted to two small pieces of bakelite (one in front, one in back) which in turn are attached to the base with metal angles. The rear piece of bakelite (measuring 2½ in. by 2 in.) is fitted with four GR sockets and serves as a mounting for the coils. The coils, to be seen between the tuning condenser and detector tube, are wound with 16 gauge enamelled or bare wire on a ⅜ in. diameter wooden dowel and, with the dowel removed, are soldered to lugs on GR plugs. The turns are spaced approximately the diameter of the wire. The leads between the two center GR sockets and the two terminals of the tuning condenser are made as direct as possible,



THE UNDER-SIDE OF THE RECEIVER SHOWING *the low frequency portion of the set. The placement of these components and of their wiring is not of any great importance.*

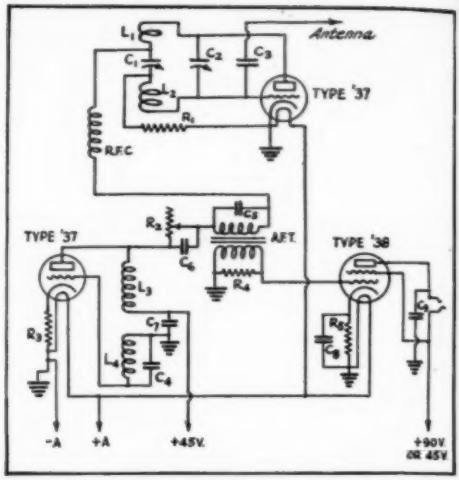


FIG. 2 — THE COMPLETE CIRCUIT OF THE super-regenerative receiver. The tubes are indicated in the same relative position as they are mounted in the set.
C_1 — 105 μμfd. Cardwell Type 404B variable condenser.
C_2 — 15 μμfd. Cardwell "Balancet" midget condenser.
C_3 — Antenna coupling condenser — see text.
C_4 — .0025 μfd. fixed condenser.
C_5 — .004 μfd. fixed condenser.
C_6, C_8 — 1 μfd. fixed condenser.
C_7 — .1 μfd. fixed condenser.
C_9 — .001 μfd. fixed condenser.
R_1 — 2 megohm gridleak
R_2 — 50,000 ohm Frost No. 2890 variable resistor.
R_3, R_5 — 2,000 ohm carbon type fixed resistors.
R_4 — 150,000 ohm carbon type resistor (or gridleak type).
L_1, L_2 — Each seven turns of 16 gauge wire ⅜ in. inside diameter with turns spaced the diameter of wire.
L_3, L_4 — see text.
"Grounds" indicated on the diagram represent connections to the metal chassis of the set.

while the leads from the two outer sockets are shot straight down to the grid and plate terminals of the detector tube socket.

Sitting transversely under the tuning condenser is the one radio frequency choke in the set. It has 35 turns of 30 gauge d.s.c. wire wound on a 5/16 in. diameter hard rubber rod. The turns are spaced about two diameters. Obviously, wooden dowel of some similar diameter would be suitable in place of the hard rubber. On the right side of the tuning condenser is the grid leak, connected directly between the frame of the condenser and the frame of the set. Connections to this frame are, as usual, shown as "grounds" on the diagram. The tubes sitting right up against the panel are pentode output tube (right) and auxiliary oscillator (left). The insulating coupling on the tuning condenser shaft can be seen immediately between them.

On the front panel is the National Velvet Vernier dial (once again used because of its beautifully smooth action) and below it, the knob of the regeneration control resistor.

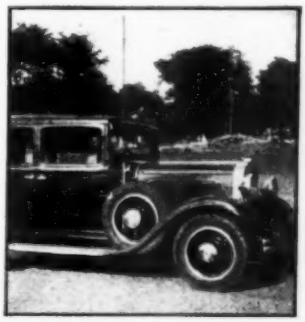
Turning the set over on its back or looking at second photograph shows at once that the remaining apparatus has been bunched up in the sub-

base cavity in a very haphazard manner. This, of course, is quite permissible because of the low frequencies on which it all operates. In this illustration, the panel is at the top. On it can be seen the resistor R_2, mounted on a piece of bakelite to insulate it from the panel. In the left corner is the unit containing the auxiliary oscillator coils L_3 and L_4. These coils are wound in a double-slotted former made up from three 1½ in. diameter cardboard discs and two ¼ in. lengths sawn from a piece of ⅜ in. diameter wooden dowel. A hole is drilled through the centers of the discs and the two pieces of dowel. The five units are then held together with a small brass machine screw which also serves to mount them to a piece of bakelite attached to the side bracket. The slots in this former are wound with 1200 turns of 36 gauge enamelled and silk covered wire for L_4 and 750 turns of the same wire for L_3. The winding was done as irregularly as possible with the former mounted in a twist-drill. It is naturally important that these coils be so connected that the tube will oscillate. This means that if the two sections are wound in the same direction the start of the first winding will go to the plate while the end of the second winding will go to the grid. The capacity C_4 across the grid coil is of .0025 μfd.

Other components visible in this illustration are the audio transformer in the right corner, the phone jack just above it and the condenser C_6 above that again. In no case is the location of these sub-base units of any particular importance. Terminals for battery supply are fitted on a bakelite strip mounted to the Benjamin brackets, while the remaining resistors and condensers are hitched into place at any convenient spot.

The wiring of these components is done with flexible "Braidite." For all wiring above the panel, however, 16 gauge enamelled wire is used.

For a preliminary test of the receiver any ordinary amateur antenna might well be used. Should the builder have our luck, the thing will operate first pop. In control, and in the sound of the thing, it will be quite similar to the usual detector-audio high frequency set except that passing automobiles and electrical machinery in operation will produce an unusually heavy "racket." Signals from a near-by 56-mc. transmitter are likely to be extremely loud if our experience is any criterion. With a six-foot antenna and in a moving automobile we have been able to operate a speaker with voice signals from a low-powered transmitter at distances up to a dozen miles—and this without any critical adjustment of regeneration. Should it be planned to operate the set in a car (for observation purposes) it will be necessary to do something to avoid interference from the ignition system. We fitted the usual BCL type "ignition interference suppressors" with the secret fear that they would fail. Surprisingly, they were completely successful. Interference from our own car was then no greater than that from other un-suppressed cars at distances of three or four hundred yards.



A COPPER TUBE ANTENNA, WITH AUTOMOBILE, USED FOR THE RECEIVING WORK

First tests were made in the car listening to the small transmitter described in James Lamb's article. A General Radio attenuation unit was used on the set to check approximate signal strength and comparisons were made within a few miles of the office of the signal audibility with various antennas and a reflector. Unexpectedly strong and surprisingly reliable signals soon led us farther afield and during the next 48 hours we made trips around the Connecticut hills and into Massachusetts totalling 350 miles. Time did not permit anything approaching a complete examination of the signal to the limits of its range nor does space allow a complete story of the observations made. However, a summary of the first results may be of interest.

(a) Very little difference was noted in the strength of signals from the low powered (20 watts oscillator input) and the higher powered transmitter (200 watts input).

(b) Excellent speech quality was obtained even though no attempt was made either to filter the transmitter supply to the usual degree or to avoid frequency modulation.

(c) At occasional locations a form of distortion, similar in effect to that of "selective fading" on the broadcast band, was noted. It did not interfere with the intelligibility of speech, however.

(d) With the car in motion at certain locations the signals would sweep from R_9 to R_2 and back to R_9 every few yards. Under these conditions, a reading of the maximum signal strength with the car stationary could be made only after the position of the car had been adjusted to within a few feet. This effect is discussed in detail in James Lamb's article.

(e) R_9 voice signals could be heard around the town and at distances up to 12 or 15 miles along Connecticut River valley (where no high ranges of hills intervened). With the receiver close under the lee of the Avon range — about seven miles to the west — signals were usually of a very low audibility. Out beyond the range, however, signals returned, within a mile or so,

(*Continued on page 42*)

League Again Demands Enforcement

STUDYING the control of out-of-band operation by careless or irresponsible amateurs, which continues to be embarrassing to the craft generally, the Board of Directors of the League at its recent annual meeting unanimously voted to renew its request of the Department of Commerce that the latter comply with the law by suspending the operator's licenses of amateurs consistently operating out of band. Accordingly the following letter has been written to the Secretary of Commerce:

AMERICAN RADIO RELAY LEAGUE

West Hartford, Conn.,
May 6, 1931

The Secretary of Commerce,
Washington, D. C.

Dear Sir:

The Board of Directors of the American Radio Relay League was in session in Hartford on May 1st and 2nd in their regular annual meeting. As in the case of the meeting a year ago, the Board gave much consideration to the problem of confining amateur operation to the authorized bands of frequency. A small minority of amateur stations continues to operate outside of the bands authorized for amateurs, despite numerous technical aids now easily available. There is a widespread feeling amongst the great majority of amateurs who are law-abiding that amateur activity should not be permitted to suffer from the careless or wanton acts of a minority. Complaints of interference from amateur operation outside of the authorized bands have been made by other services during the past year, but it is the view of our Board of Directors that the Department of Commerce has not yet exerted a proper effort in the enforcement of regulations. It is the opinion of our Board that the well-being of amateur radio requires a stricter observance of the frequency regulations.

Accordingly I am instructed by the unanimous vote of my Board to advise you that the American Radio Relay League again requests the Secretary of Commerce to comply with Section 5 (D) of the Radio Act of 1927 as amended, by immediately putting into effect the policy of suspending the operator's licenses of all persons consistently violating the regulations of the Federal Radio Commission by operating outside the frequency bands prescribed for amateurs.

This office will be pleased to be of any assistance that it can in the carrying out of this policy.

Respectfully yours,

K. B. WARNER,
Secretary and General Manager

Every thinking amateur must realize that this is a vital problem to all of us. It is to be solved by each amateur giving individual attention to his own transmitting activity. Certainly it is highly desirable for every amateur transmission to be within an authorized amateur band. There is no reason why *you*, the reader of these lines, should get into trouble on this score. Plenty of splendid aids exist to make it easy for you to play the game squarely. In particular, see *QST* for October, 1930, page 9, for data on the assembly of an inexpensive and easily built dynatron frequency meter; and see any *QST* for information on the scheduled transmission of weekly standard-frequency signals by the stations of the A.R.R.L. Standard Frequency System, which will enable you to calibrate and maintain your frequency meter with a high degree of accuracy.

In addition to these aids there are many powerful commercial and government stations operating adjacent to our bands, whose known frequencies serve as "markers" and are of great aid in calibrating and in staying within the bands. For instance, it is self-evident that an amateur "outside" of one of these markers is outside the band. Not exact, not always reliable, they nevertheless mark the bands in a first approximation which makes it easy to be "inside" — and safe. Many such lists have been published in *QST*. The most useful ones are here repeated:

"MARKERS"

In vicinity of, kc.	*Good markers, kc.*	*Also useful, kc.*
3500	None	Night airways phones, 3484.
4000	NAA, 4015 WIR, 4050	Naval Reserve, 4045.
7000	WLM, 6990 RXC, 6985 WIZ, 6965	WEO, 6957.5 WKP, 6950
7300	None	PDT, 7350 WEM, 7400
14,000	KWT, 13960 WIK, 13930	CKW-CKZ, 13920 WQS, 13915
14,400	GBW, 14440 WNC, 14470	WQL, 14815

—*K. B. W.*

Strays

W5CT wonders if the "voice call for dynamic speaker" advertised in one of the magazines recently is "Hello CQ."

— - - - —

W1BKD recalls memories of low-power records of former years by telling us that he worked a station 250 miles away with an input of .06 watts to a pair of 201-A's. This figures out to be about 4000 miles per watt.

— - - - —

W7CT immerses his 210 in an oil bath to keep the frequency of his transmitter from creeping. The tube is mounted upside down in a can of light oil, and the drift is considerably reduced. If the filament is kept lighted there is no drift at all.

— - - - —

The proposed RMA color code for the identification of the range of resistors has been worked into a neat little chart by the International Resistance Company, Philadelphia, Pa. By means of three dials the resistance range represented by the combinations of colors may be easily determined. It is a useful gadget for the service man. A limited quantity is available for distribution, and one may be obtained by writing to the address above.

The A.R.R.L. Board Meets

By K. B. Warner, Secretary, A.R.R.L.

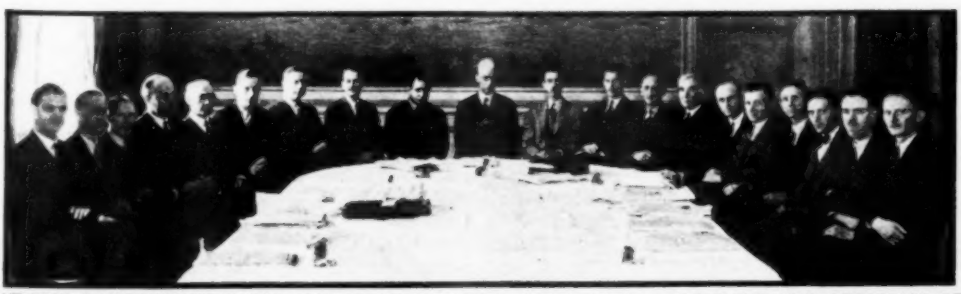
THE Board of Directors of the American Radio Relay League assembled in Hartford for its regular annual meeting on the first day of May. Most of the Directors had come in a day or two early to inspect the headquarters offices, the headquarters station, and to observe the carrying-on of League business at West Hartford. On Friday the 1st the meeting opened at the Hartford Club in Hartford, with every League official in attendance. There was President Maxim, Vice-President Stewart, Canadian General Manager Reid, and every last one of the Division Directors. There were the remaining headquarters officers and also General Counsel Segal and Assistant Secretary Budlong. For two days the meeting lasted, the Directors deserting their conference table only for the meals which were served in an adjacent room. All of the Directors had made studies of League conditions in their home areas before coming to the meeting, and so for two days every aspect of League welfare was thoroughly canvassed and policies made and instructions given to the headquarters for another year.

It is our purpose in this account to give a bird's-eye view of the meeting and to report briefly all of the things done by the Board.

After the opening roll-call and the approval of the minutes of the previous meeting, each of the five officers of the League read an annual report in which he informed the Board on the status of that portion of League work which has been in his hands, and made recommendations for the study of the Board at this meeting. These reports, and the report of the General Counsel, were then accepted and all of the recommendations therein listed for examination by the meeting. The Board then examined the actions of the Executive Committee since the last meeting of the Board, in its constitutional duty of carrying-on for the Board between the meetings of the latter, and ratified and confirmed all of its actions. Proceeding then to examine some of its own actions which had been taken by mail during the preceding year, the Board ratified its own votes appropriating funds for representation at the C.C.I.R. meeting this summer, for a reconsideration of its plans for the government of 'phone operations, for adjusting the salary of the Communications Manager, and for a Madrid frequency-band policy.

The ratifying of the Board's policy for frequency bands to be asked for at Madrid occurred only after a thorough examination of the subject from every angle, as many Directors had requests from their members that the League undertake to secure a widening of the bands at the Madrid conference. After receiving confidential information regarding the plans for Madrid, the Board voted without dissenting voice to confirm its previous decision to seek at Madrid the existing amateur frequency bands. It must be apparent that there is more to the matter than can be mentioned in these lines in *QST*; it must suffice here to say that the Board, after the most careful consideration of the matter, was unanimous in confirming its previous decisions.

After making an appropriation for the expenses of this meeting of the Board, the reports of Directors were heard. Each Director in turn reported in detail on the status of amateur activities in his territory and the sentiments of members on all important issues and expressed his views on what ought to be done on these ques-



AT THE CONFERENCE TABLE IMMEDIATELY AFTER BREAKFAST: DIRECTORS AND OFFICIALS OF THE LEAGUE PAUSE BEFORE STARTING THE SECOND DAY'S SESSION

We see, left to right: F. M. Corlett, W. T. Gravely, Treasurer A. A. Hebert, K. W. Weingarten, A. H. Babcock, L. G. Windom, Alex. Reid, A. L. Walsh, Paul M. Segal (General Counsel), President Maxim, Secretary Warner, Assistant Secretary Budlong, Vice President C. H. Stewart, E. C. Woodruff, H. F. Dobbs, R. J. Andrews, H. W. Kerr, M. M. Hill, Communications Manager Handy, Cy. L. Barker. Unavoidably absent at the moment of taking the photograph was Director Best.

tions. Doctor Woodruff also rendered an auxiliary report as chairman of the Directors' Radio Chain.

The Board then buckled down to an examination of radiotelephony, a knotty problem which had been discussed for many hours at each Board meeting the last several years. Again the question was examined this year for over two hours by the whole Board and then a committee was appointed with the duty of studying the question further and bringing in a proposal. Late that night, after the Board had adjourned for the day, the committee went into session and after burning much midnight oil, brought in a plan the next day, as will be discussed hereinafter.

The Board then considered further plans for the important Madrid conference. Thankful that our A.R.R.L. in past years has accumulated a surplus available for such extraordinary needs, the Board authorized the Executive Committee to appropriate up to $10,000 to cover the expenses of A.R.R.L. representatives to Madrid in 1932 and named Messrs. Warner and Segal as two of its representatives to attend that conference, to which additional representation may subsequently be added. Some rather neat strategical plans which have been proposed were examined, but because the Madrid meeting has now been postponed to the fall of 1932 instead of the spring, with the Board again meeting before then, final consideration was postponed until more information is available. A project for certain international publicity was examined but abandoned.

Again the Board gave lengthy consideration to the embarrassment which amateur radio as a whole is suffering from the out-of-band operations of some amateurs. After thoroughly canvassing the subject the Board voted to renew its demand of the Department of Commerce that it enforce the regulations by suspending the operator's licenses of amateurs consistently violating regulations by operating outside the amateur bands. This question is further discussed in another article in this issue.

The possibility of changes in the domestic radio law of this country were then looked into rather thoroughly and the expressions of the Board secured for the guidance of the headquarters officers. By this time it was 10:00 p.m. and the Board had had a hard day, so it adjourned until the following morning — all except the 'phone committee, which thereupon went in to session at the Hotel Bond, to work until all hours.

The following morning the Board had its picture taken and then went to work again. The first question this day was on making certain amendments to By-Laws. These were not of great importance, being rather minor matters. The rules governing the election of the Canadian General Manager were changed to conform with the practice of choosing United States Directors, a change which had been overlooked a couple of years ago when the United States regulations were changed; the headquarters location was specified as West Hartford, to accommodate the recent move to new offices; a West Hartford bank was named as one of the official depositories of the League; written annual reports from Directors were provided for; and the regular order of business at Board meetings was amended to conform with present practice.

We are reminded to suggest here that more members of the League familiarize themselves with our Constitution and By-Laws. Copies of these, revised to date, are always available at headquarters, and will be sent at any time without charge to any member who will write for them.

Then the special committee on telephone allocations reported and again the old 'phone question was discussed pro and con for a long while, with countless suggestions considered. Finally the proposal of the committee was accepted and approved, the headquarters instructed to endeavor to secure its adoption at Washington; and at the same time the Board instructed the headquarters to do everything possible to encourage c.w. operation in the range 1715 to 1875 kc. The radiotelephone program adopted by the Board deserves an expanded explanation; a further discussion of it will be found at the end of this report.

The Board reviewed its amendment of By-Law 4 a year ago but made no further changes. It examined the practice of Army stations in the Philippine Islands in reimbursing American amateurs for money paid out on telephoning and telegraphing rush messages, and voted to request these stations to make such repayments only on itemized bills showing actual disbursements for expenses, so as to avoid any suspicion of compensation for amateur activity.

The Board did nothing about changing any Division boundaries but instructed the Executive Committee to study the question further. A second operator for W1MK was authorized, if it can be afforded. The participation of headquarters personnel in League contests was authorized but with the understanding that they are not eligible to receive prizes or certificates. The stations of the A.R.R.L. Standard Frequency System were whole-heartedly thanked for their coöperation. The matter of "High Power Holiday" coming up for discussion, the Board considered that matter to have been purely one of discussion among amateurs relating to individual station operation and having no connection with regulation or any possible limitation of power imposed by the authorities, the Board recognizing that federal power limitations will remain at one kilowatt.

It was then 2:31 of the afternoon of the second day, and the Board had completed its program. At this hour adjournment occurred. At best, this brief account gives only the high lights of the meeting and cannot hope to give the reader any

adequate impression of the many things which were discussed, of the comprehensive preparation which the Directors had made for the meeting, and of the really exhaustive fashion in which every angle of all of these problems was gone into. Perhaps the reader can visualize for himself that twenty-one well-informed officials of amateur radio, sitting around a table for two days and each speaking of his personal knowledge, were able to bring to bear upon our problems a very considerable measure of thoughtfulness, intelligence and devotion.

THE BOARD'S 'PHONE PLAN

The 'phone problem in amateur radio is in many respects like national prohibition; in essence it is probably impossible of solution. While realizing that, the Board's plan endeavored to take account of the necessity for providing more space for 'phone, more space for c.w., of avoiding interference with other services, of encouraging greater use of the 1715-kc. band by both 'phone and c.w., yet avoiding interference with broadcast listeners, of providing somewhat more strict regulations for 'phone operation but in such manner as to avoid injustice to any amateur. The Board was confronted by the need of 'phone amateurs for more space in the 80-meter band, the opposing demand of a multitude of c.w. operators that 'phone be driven completely out of this band, and the desire of everyone, particularly the 'phone operators themselves, that the operators of 'phones in the congested portions of the spectrum be obliged to show some special technical qualifications so that the assignment would be big enough to be useful for those who ought to have the right to use it. Here is the Board's plan, which endeavors to make the best possible arrangement of these requirements:

THE DIRECTORS AND OFFICIALS AGAIN FACE THE CAMERA ON THE STEPS OF THE HARTFORD CLUB AT THE CLOSE OF THE MEETING

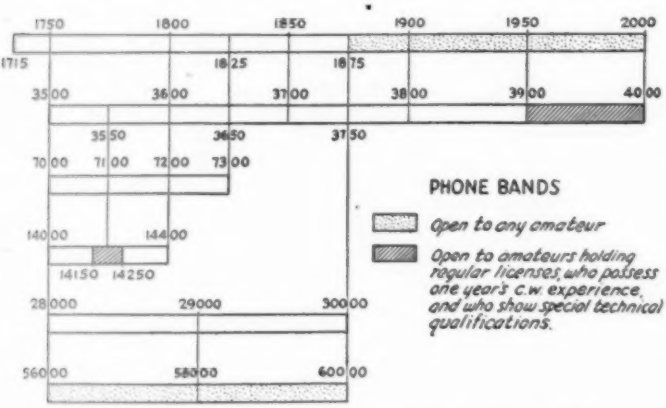
To open up to every amateur, without more ado, whether he possesses a regular operator's license or only a temporary certificate, the right to operate 'phone in the bands 1875 to 2000 kilocycles and throughout the 5-meter band. To open up to regularly licensed amateur operators who show special technical qualifications the right to operate 'phone in an expanded 80-meter assignment from 3900 to 4000 kilocycles; and in a narrowed 20-meter assignment from 14,150 to 14,250 kilocycles. It is part of this latter plan that the required special qualifications will not be considered as possessed by the holders of temporary operator's certificates. The general plan is that in order to operate 'phone in the 80-meter and 20-meter bands, the operator must have held an operator's license or certificate for at least one year; must now possess himself of a regular license, and not a certificate; and must now pass some form of a special amateur examination upon matters relating to amateur radiotelephone technique and thus disclose the possession of some small special knowledge of telephony in addition to his previously demonstrated knowledge of c.w.

Perhaps a better idea of the Board's 'phone plan is to be obtained from an examination of the accompanying illustration. First it is to be noted that the 1715–2000-kc. band is cut in two, and the portions from 1875 to 2000 kc. made available for 'phone. This is the half of the band the farthest removed from broadcast listeners, which is a good thing. It has five times the width of the existing 80-meter 'phone privilege and so possesses ample width. It is confined to half of the band width not only because of the probability of broadcast interference from operation at the low frequency end of the band but because of the growing appreciation of the need that c.w. will have for some of these frequencies in a short while — see our February editorial. This region from 1875 to 2000 kc. (and the entire 5-meter band as well will be open to every amateur, without the necessity of showing any special technical qualifications. This is an extremely useful frequency range, splendid for 'phone work, and the Board hopes that more 'phones will take advantage of it.

The 80-meter 'phone sub-band in this plan is moved from the low-frequency end to the high-frequency end of the band — from 3900 to 4000 kilocycles. Examining the illustration, it will be seen that if the existing 'phone privilege at 3500 kilocyles were expanded to cover 100 kilocycles, as was desired, it would then occupy all that portion of the 80-meter band which is harmonically related to the 14-megacycle band and deprive c.w. stations of any opportunity to work in the 80-meter band on the same crystal with

which they might desire to double twice into the 20-meter band. This was one reason why this band had to be moved. Another was that it ought to embrace the range of frequencies in harmonic relation to the 'phone frequencies in the 160-meter band, so that 'phone stations might have the opportunity to use a crystal between 1950 and 2000 kilocycles and thus work in either of two 'phone bands at will. It is also to be remembered that we have had a serious QRM situation with a delicate commercial 'phone service adjacent to the 3500 kc. end of our band and for this so difficult that only a physicist can qualify but at the same time to keep out the beginner and the absolute tyro, and confine the privilege to those who can demonstrate a normal amateur knowledge of the technique of 'phone, the evils of frequency modulation and how to overcome them, the importance of amplitude modulation and how to secure it, etc.

The Board's plan above outlined is not yet in effect. It is important to note that no amateur as yet has the right to operate 'phone between 3900 and 4000 kilocycles. These matters are still under negotiation at Washington and it is impossible at this writing to say when they will become effective. Nor can it be prophesied in advance just what the arrangements will be for showing the special qualifications necessary for operating in the 80-meter and 20-meter bands. Complete information will be broadcast and published in **QST** *as soon as it is available. In the meantime, all of the old regulations continue to apply. It is expected that any change in regulations will occur only with about four months advance notice, to give ample time to every operator to qualify if he has the necessary ability, and to make the necessary small changes in his equipment.*



1931 AMATEUR BANDS, SHOWING A.R.R.L. BOARD'S PHONE PLAN.

that there are no good frequency markers there, so that out-of-band 'phone operations has been rather distressing. Both of these objections are met if the 'phone band is put at the high frequency end. There are excellent markers there, but we probably will have to call upon the Navy to clean up the key-clicks from NAA.

Considering the limited use of the 20-meter band by 'phone and the extent to which these stations have not confined themselves to the portion of the band assigned for 'phone, it is part of the Board's plan to narrow the 20-meter 'phone privilege to embrace only the central quarter of the band, from 14,150 to 14,250 kc. Both this band and the 3900–4000 kc.-band are then to be made available only to amateurs who have served a year's apprenticeship as demonstrated by having held some kind of an operator's license for that length of time, who now possess a regular license and not a certificate, and who furthermore show that they know a little something about what they are doing. This has been one of the chief requests of the 'phone people — that c.w. men just "fooling around" with loop modulation and beginners who know nothing of the importance of frequency stability and the niceties of modulation methods be denied the right to operate in their most useful and congested band. It is not intended to make the requirement

Incidentally, it is to be noted that the proposed changes in frequency are in the right direction — crystals can be ground a few molecules and antennas can be clipped a few inches much easier than vice versa. It is also to be pointed out that the Board's plan does not contemplate any exclusive 'phone bands, as the fundamental rights of all amateur stations to all of the bands must not be violated. The 'phones need have no worry on this score, however, because amateur practice has amply demonstrated that a non-exclusive 'phone band soon assumes the aspects of an exclusive assignment because of the difficulty which c.w. stations have in working through the 'phones.

Nobody can claim that this is a perfect solution of the 'phone problem. It admittedly isn't. It won't satisfy everybody. But at the same time, it must be said that it is the best possible solution to-day, and that it has been arrived at sincerely and only after the most exhaustive sort of study. It does have the practical effect of giving both 'phones and c.w. stations more space and it provides the bulk of the 'phone amateurs with what they wanted. Realizing that few things are perfect in this world, may we not now hope that this program will be accepted by c.w. and 'phone men alike and embraced as at least the temporary

(*Continued on page 36*)

Inexpensive Crystal Control

A Three-Band Low-Power Transmitter

By George Grammer, Assistant Technical Editor

ALTHOUGH the desirability of crystal control for transmitters is almost universally admitted, its actual application is not nearly so universal. Many of us, while perhaps agreeing that the signal put out by a crystal transmitter is as nearly ideal as anything we have, still stick to outfits with more flexibility in changing frequency and fewer complications in design and operation; some insist that the cost of tubes and parts for a crystal-controlled transmitter that can cover three bands is too great. Although it is true that a crystal-controlled transmitter is likely to cost more than a self-excited outfit of equivalent power, the gain in frequency stability and power amplifier tube efficiency more than makes up the difference. As has been pointed out in a previous article,[1] an amplifier properly excited can always be expected to give more power output for a given plate input than a self-excited oscillator, because it is possible to use a better *L-C* ratio in the tank circuit and because the amplifier does not have to supply its own grid losses. Besides these material gains, there is the pride of ownership — difficult to appraise in terms of cash. A crystal note is in a class by itself — the sort of thing that causes its owner to feel right at home in the most select ham company.

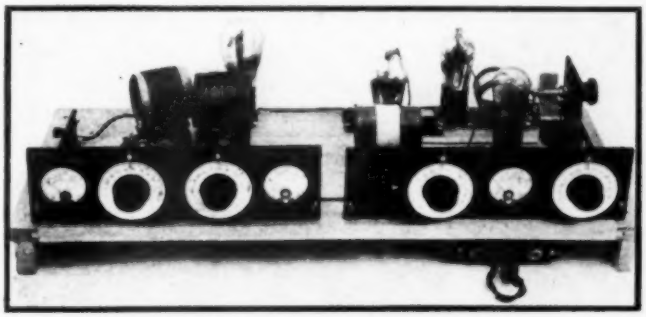
The obstacle for the amateur who wants to crystal-control a Type '10 tube or two in his transmitter usually is the expense involved. But crystal control for the low-power transmitter need not cost such a lot. A Type '10 tube does not require a tremendous amount of excitation to work efficiently, and therefore the tubes preceding the output amplifier may work at rather low voltages. This in turn means that low-priced receiving parts; midget tuning condensers, receiver-type mica fixed condensers, wire-wound coils instead of copper tubing — all may be used without danger of breakdown. Furthermore, the tubes in the "exciter" stages, the oscillator and doublers, may just as well be receiving tubes. True, the crystal itself will cost something, and a mounting will have to be made or purchased, but excellent crystals are available from numerous sources at figures that seem like ten-cent store prices compared with the amounts paid for them in the early days of crystal control.

All of which simply means that no great outlay of money is necessary if a Type '10 tube is to be crystal-controlled. Once the crystal itself is acquired the other equipment can be accumulated without causing the present financial depression to become noticeably worse.

It is the purpose in this story to point out one of several possible ways in which receiving tubes may be utilized to excite a Type '10 amplifier for operation on three bands. Many other schemes and tube combinations no doubt will suggest themselves to the experimenter.

USING RECEIVING TUBES

Several experiments over quite a period of time have indicated that if a tube is to give anything like the output it is capable of producing as a self-excited oscillator, it must be excited by a preceding tube on the same frequency; in other words, the tube which is to deliver power to the antenna should not be a doubler except where efficiency and output are of small consequence. It is apparent, therefore, that at least three tubes, in addition to the final amplifier, will be necessary if the transmitter is to cover three bands: one as the 3500-kc. crystal oscillator, the second as a 7000-kc. doubler and the third as a 14,000-kc. doubler. Now if those three tubes are Type '10's, as is quite common practice in crystal-controlled transmitters, it is evident that the cost of the tubes alone will be quite an item



THE COMPLETED TRANSMITTER

Using a Type '27 crystal oscillator, a pair of '24's as doublers or amplifiers, and a Type '10 power amplifier. It may be operated on 3.5, 7 or 14 mc.

[1] "More Power with Better Frequency Stability," p. 27, February, 1931, *QST*.

in a transmitter with only a 7½-watt tube at the output end. For this reason it was thought desirable to try some of the many varieties of receiving tubes for the oscillator and doubler stages to see whether or not it was possible to get sufficient excitation to run the last tube. For the type of transmitter we had in mind the '27 for the oscillator and the '24 for the doublers seemed to be the most suitable, because indirectly-heated cathodes require no filament by-pass condensers and because several people who know something about tubes had assured us that the cathodes would stand a 10- or 15-milliampere plate current without danger of materially shortening the life of the tubes. The '24's could be used either as doublers or as s raight-through amplifiers without neutralization, thus making it possible to get additional excitation without going to the trouble of neutralizing anything but the final amplifier itself.

The remaining question was that of whether or not the screen-grid tubes would work well as doublers and whether or not they would have enough output to excite the Type '10 tube in the amplifier. Previous experiments with '24's as frequency doublers[2] had not worked out very well, probably because at the then maximum voltage rating of the tubes, 180 volts, no tube would give very much power output, even as a straight amplifier. Since that time, however, the rating has been raised to 250 volts, and at the latter voltage the output could be expected to be considerably increased.

An experimental layout was accordingly built up, and at 250 volts the '24's were found to work nicely as doublers. It was found that with 150 volts on the '27 oscillator and 250 volts on a '24 used either as a straight-through amplifier for 3500 kc. or as a doubler for 7000 kc., it was possible to put as much as 50 watts on the plate of a Type '10 neutralized amplifier and work the tube at an efficiency high enough to allow it to run continuously without causing the plate to show any change of color. On 14,000 kc., owing to the impossibility of getting as high *L-C* ratios at this frequency as at the lower frequencies, and because the efficiency of any type of amplifier begins to drop off considerably at frequencies of this order, the performance was not quite so good. It was possible, however, to run the input up to about 35 watts before the amplifier showed signs of heating. A rough measurement of the power output on the different bands showed that the amplifier would deliver between 10 and 15 watts to the antenna on 14,000 kc. and 20 to 30 watts on 7000 and 3500 kc. Increasing the voltage on the oscillator and doublers helps to step up the power a great deal; with 300 volts on the doublers there is ample excitation for the amplifier. The tubes have been operated at this voltage without showing any tendency to break down, but probably it would not be advisable to exceed this figure. The Type '27 tubes will often show gas if the voltage is increased beyond 200.

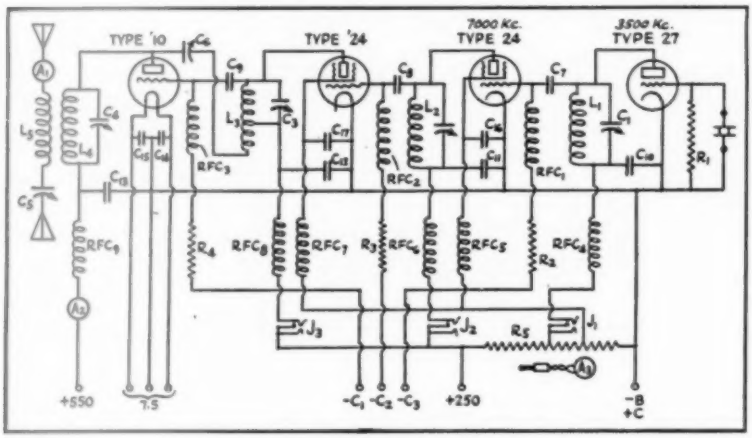


FIG. 1. — THE TRANSMITTER CIRCUIT

C_{1-3} — *90–100 μμfd. tuning condenser.*
C_4 — *100 μμfd. (preferably with greater plate spacing than the usual receiving condenser).*
C_5 — *250 μμfd., receiver type.*
C_6 — *25μμfd., double-spaced.*
C_{7-9} — *100-μμfd. fixed mica condenser.*
C_{10-13} — *.001-μfd. fixed mica condenser.*
C_{16-17} — *.01 μfd. fixed mica condenser.*
R_1 — *50,000 ohms.*
R_{2-4} — *10,000 ohms.*
R_5 — *Pilot No. 960 voltage-divider (see text).*
RFC_{1-3} — *Pie-wound short-wave chokes.*
RFC_{4-9} — *Two-inch winding of No. 36 d.s.c. on ½-inch form.*
J_{1-3} — *Single closed-circuit jacks.*
A_1 — *R.F. ammeter, 0–1 or 0–2 amp.*
A_2 — *D.C. milliammeter, 0–200.*
A_3 — *D.C. milliammeter, 0–50.*
L_1 — *20 turns of No. 18 d.c.c. on 2" form, close-wound.*
L_2 — *14 turns of No. 18 d.c.c. on 2" form, close-wound.*
L_3 — *3500 kc. — 35 turns of No. 18 d.c.c. on 2" form, tapped at 14th turn.*
7000 kc. — 20 turns of No. 18 d.c.c. on 2" form, tapped at 8th turn.
14,000 kc. — 9 turns of No. 18 d.c.c. on 2" form, tapped at 4th turn.
All three coils are close-wound. The smaller portion of each coil is for neutralizing.
L_4 — *3500 kc. — 17 turns of No. 18 d.c.c. on 2½-inch form.*
7000 kc. — 12 turns of No. 14 enamelled on 2½-inch form.
14,000 kc. — 5 turns of No. 14 enamelled on 2½-inch form.
All windings spaced to make length of coil 1½ inches.
L_5 — *Antenna coil. Use one of the idle amplifier tank coils, or make coils to fit individual antenna tuning conditions.*

[2] "14-mc. Phone Transmission," p. 17, March, 1930, *QST*.

Following these experiments a breadboard transmitter was built up for operation on all three bands. This outfit is shown in the accompanying photographs, and a wiring diagram appears in Fig. 1. As the diagram shows, the circuit is the conventional crystal layout with capacity coupling between stages. The plates of all tubes are series-fed, which relieves the plate chokes from carrying much of a burden. Capacity coupling to the grids of the tubes makes it necessary to bring the d.c. grid returns back through an r.f. choke, and these chokes must be good or a large part of the excitation is likely to leak off through them. Pie-wound chokes (the ones on the set in the photograph are Silver-Marshall Type 277's) seemed to work best in the grid circuits. The others are straight cylindrical chokes of the usual type. A 10,000-ohm resistor is placed in series with the grid returns of the doublers and the amplifier to further aid in blocking out the r.f. and to provide some automatic bias for the tubes. The oscillator grid leak is a 50,000-ohm unit.

Three two-inch type meters are incorporated in this transmitter. One reads the plate current in the oscillator or doubler stages by means of a plug and jack system. The other, a higher-range instrument, is connected permanently in the plate circuit of the amplifier. A single milliammeter of course would serve for all four measurements, if necessary. The third meter reads the antenna current. Although it is possible to get the transmitter working without the aid of any meters at all, a plate milliammeter at least will prove an invaluable aid in tuning as well as a safeguard for the tubes in that it will show whether or not they are drawing excessive plate current.

The layout of parts shown in the photograph provides short leads between stages and yet allows the tuned circuits to be sufficiently separated to minimize stray coupling between them. To this end the inductances for the first three tubes have been mounted so that their fields will not interlock. The tuning control for the oscillator is at the right of the right-hand panel on the front of the breadboard (this board measured 10 by 27 inches), while the 7000-kc. doubler stage is mounted at the rear of the board and slightly to the left of the oscillator. The tuning condenser for this stage is mounted on a small square of bakelite set perpendicular to the rear edge of the board. This control need not be touched after having been adjusted once for a given crystal, because this stage always works on the 7000-kc. band. National Type SE-100 condensers are used in the oscillator and doubler stages. The crystal mounting plugs into the jacks on the small strip of bakelite mounted alongside the panel which holds the tuning condenser for the 7000-kc. stage. The two bakelite panels at the front of the baseboard are each 3½ by 12 inches.

The third tube is used as a straight amplifier for 3500 kc., as a doubler for 7000 kc. (or as a straight 7000-kc. amplifier following the first doubler), or a 14,000-kc. doubler. The inductance for this stage is therefore made plug-in, and since the neutralizing coil for the amplifier is part of this inductance a three-plug mounting must be used. The plate milliammeter for the first three stages is mounted between the tuning condensers for the first and third tubes; a bakelite strip on which three jacks are mounted is placed below the meter on the bottom side of the breadboard. The small condenser at the left of the panel, a Cardwell double-spaced "Balancet," is the neutralizing condenser for the Type '10 amplifier.

The fact that the control grid connections for the '24's are on top of the tubes makes it an easy matter to change bands. Referring to Fig. 1, it will be seen that the plate of the '27 oscillator is connected to one side of the coupling condenser C_7, and that the other side of C_7 is connected to RFC_1, the grid choke for the following stage. The connection between C_7 and the grid of the following tube is made by a piece of flexible wire about six inches long which terminates in a screen-grid clip. The connection between the plate of the first '24 doubler, coupling condenser C_8, RFC_2 and the grid of the second '24 is made similarly. The two Type '24 tubes are placed on the baseboard so that the flexible lead from C_7 can be attached to the grid cap of either tube; it is therefore possible to cut out the first '24 entirely, simply by removing the grid clip from that tube and placing it on the second '24. The flexible lead from C_8 is left floating when this is done. By this process RFC_1 becomes the grid choke for the second '24 tube. The stages are connected up in this way when the set is to be used on 3500 kc., in which case the 7000-kc. stage is unnecessary. This connection also may be used on 7000 kc., when the '24 actually in use (the second '24 from the right in Fig. 1) works as a doubler. An alternative connection for 7000 kc. would be to connect C_7 to the grid of the first '24, which is tuned permanently to 7000 kc., and connect C_8 to the grid of the second '24. In this case the second '24 is being used as an additional amplifier. This will generally give more excitation for the final amplifier than the first arrangement, but there is a possibility that there will be enough stray coupling between the two stages to cause them to self-oscillate. This may be checked readily in a monitor by listening with the crystal oscillator off. If there is no tendency towards self-oscillation it is just as well to take advantage of the additional amplification.

On 14,000 kc. the three tubes work in regular order; the oscillator on 3500, first doubler on 7000 and second doubler on 14,000.

The view of the underside of the baseboard shows how the various chokes and by-pass condensers are placed. Although the available space

is small every effort has been made to prevent coupling between stages by mounting the chokes at right angles to each other. The two by-pass condensers for the screen-grids of the '24's have been mounted so that the leads from the tube sockets come directly down through the board to them, making extremely short connections.

Binding posts for the various plate, filament and bias supplies are mounted on bakelite strips at the rear of the baseboard. They are identified in the photograph.

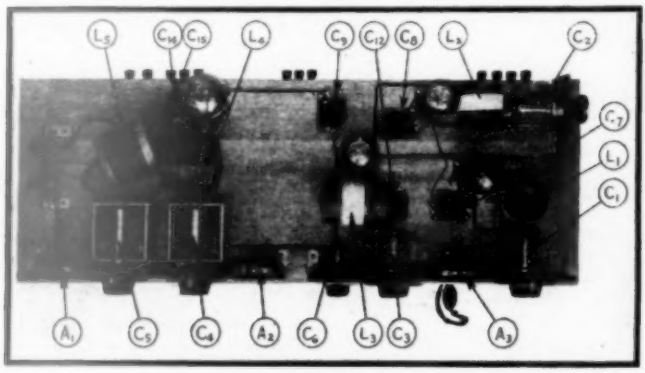
THE OUTPUT AMPLIFIER

The amplifier occupies the left-hand side of the baseboard, and to prevent feedback has been moved as far away as possible from the small tubes. The panel holds the amplifier plate milliammeter, plate tank condenser, antenna condenser and antenna ammeter. The amplifier tank inductance is made plug-in, as is also the antenna coil. The latter coil plugs into a bakelite strip which is pivoted at one end so that the coupling between the two inductances can be varied. The tuning condensers are the new Cardwell Midway type, a 250-$\mu\mu$fd. receiving condenser being used for the antenna and a 100-$\mu\mu$fd. transmitting model for the amplifier tank. Condensers with ordinary receiver spacing between plates often spark over when used in a low-C tank circuit, even though the plate voltage is only of the order of 500 volts.

Although the axes of the amplifier tank coil and that of the preceding '24 tube are parallel, the amplifier has shown no tendency to oscillate when properly neutralized. If the amplifier should oscillate in spite of apparent neutralization, a baffle shield, simply a grounded sheet of aluminum mounted vertically between the two stages, should fix things up.

A series connection for the antenna coil and condenser is shown in the diagram. The type of antenna in use will determine the exact form of connections to be used, and the choice of antenna circuit will have to be left to the individual constructor.

The amplifier tank coils are wound on 2½-inch bakelite tubing. No. 14 enamelled wire is used for the 7000- and 14,000-kc. coils, while the 3500-kc. coil is wound with the same wire as is used for the other coils in the set; No. 18 d.c.c. As the tank circuit has comparatively little tuning capacity the circulating current is small, so there is no particular heating because of the small conductor.



A PLAN VIEW

This requires little explanation, since all the parts above the baseboard are indicated. The crystal plugs into the jacks on the small strip at the extreme right

POWER SUPPLIES

It is advisable to use two power supplies to operate the transmitter, one capable of delivering 250 to 300 volts at about 60 milliamperes for the oscillator and doublers, and the other to furnish about 550 volts at 60 to 70 milliamperes for the Type '10 amplifier. Offhand it would seem that one power supply should be sufficient for the whole outfit, but practically it does not work out so well. With most power supplies ordinarily used with Type '10 tubes the voltage drops to a rather low value when the current drain becomes high; we have in mind one in particular which used a 550-volt transformer and the conventional brute-force filter, the voltage output of which was about 450 volts at 100 milliamperes. As the total drain in this case would be in the vicinity of 120 to 130 milliamperes, at which the voltage was in the vicinity of 400, the amplifier did not have much to work with. A greater objection, however, is that as the amplifier is keyed the voltages on the other tubes fluctuate between wide limits. For example, the voltage dividers or series resistors might be adjusted with the amplifier plate circuit closed so that the actual voltage on the doublers is 250; with the amplifier load off, however, the voltage could easily rise to 350 or 400, which is not desirable.

For these reasons it is better to use a separate power pack for the first three tubes. Such a pack can be built quite inexpensively from replacement parts used in broadcast receivers, and is well worth the small additional investment.

A voltage divider, R_5, is connected across the 250-volt power supply in this transmitter to provide reduced plate voltage for the oscillator tube and screen voltage for the '24's. The unit shown in the photograph is a Pilot No. 960 resistor. A similar divider can be made up by connecting three resistors of the proper values in series. The part between the positive side and the oscil-

lator tap should be approximately 4000 ohms; between the oscillator tap and the screen grid tap 3600 ohms; and between the screen grid tap and the negative side, 5000 ohms. Differences of 10% in these values will make no practical difference.

TUNING

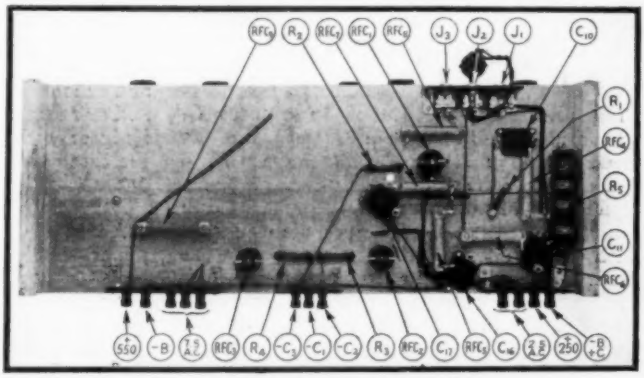
After the transmitter is wired and the connections have been checked, the filament, plate, and bias supplies should be connected to the proper binding posts. For the time being the amplifier plate supply should not be connected. The crystal should be plugged in and the grid clips left off the '24 tubes until the oscillator is in operation. The bias on the '24's should be about 45 volts at the beginning, and the same battery may be used for all tubes.

The plug for the milliammeter A_3 should be placed in the oscillator jack and the plate current noted. This current will be in the neighborhood of 20 milliamperes if the tube is not oscillating. Slowly vary C_1 until there is a dip in the plate current, which indicates that the tube has begun oscillation, and set the condenser at a point slightly above the minimum plate current reading, which will be, ordinarily, about six or eight milliamperes. A loop of wire connected to a flashlight lamp may be coupled to the oscillator inductance and the brightness of the lamp will give some indication of the strength of oscillation.

The 3500-kc. coil for the '24 amplifier, L_3, should next be plugged in the coil socket and the clip from C_7 placed on the grid cap of the second '24. The first '24 is not used on this band. Connecting the amplifier to the oscillator probably will cause the oscillator tuning to change, so that C_1 should be adjusted again until the plate current is at a minimum. Then put the milliammeter plug in J_3 and vary C_3 until the plate current on the '24 shows a dip, and again set the condenser for minimum plate current, which will be about eight or ten milliamperes, probably. The tuning lamp will be useful for checking this stage also, and should light up fairly brightly.

Neutralization of the Type '10 amplifier is the next step. As the process of neutralization has been covered very thoroughly in *QST* [3] we need not go into it here except to say that during the operation the grid circuit of the amplifier should be closed; that is, if the key is in the center-tap of the amplifier the key should be closed, although the plate voltage should be off, of course. The filament of the tube should be lighted also.

After neutralization has been secured the amplifier plate voltage may be applied and the tank condenser, C_4, adjusted for minimum plate current. The antenna should not be coupled to the amplifier during this adjustment. It is important that in adjusting C_4 the plate voltage be applied only for periods of time long enough to indicate whether the tuning is near resonance. If the tuning is off resonance the plate current may run as high as 200 or 250 milliamperes, and if the key is held down for any length of time with such plate currents the tube will rapidly lose its emission.



UNDERNEATH THE BASEBOARD

Ordinary "hook-up" wire is used for most of the connections. The filament connections for the '27 and '24's, omitted from Fig. 1 to avoid complicating the diagram, are brought out to a pair of binding posts on the right-hand strip.

This happened to several tubes during the process of testing this transmitter, and although they would afterwards function fairly well, the power output was noticeably reduced. The value of plate current at resonance with the antenna disconnected should be between 10 and 20 milliamperes on 3500 kc.

The antenna circuit should next be coupled to the amplifier and tuned to resonance. One of the unused tank coils is ordinarily plugged into the antenna coil socket and used as a coupling coil, but since the size of coil necessary will be determined by the constants of the antenna of feeder system it is impossible to give exact specifications. It may be necessary to wind separate coils which will allow correct tuning.

As the amplifier tube takes more plate current when C_5 is tuned nearer to resonance, C_4 should be readjusted to compensate for the effect of C_5. The maximum reading on the antenna ammeter will indicate the correct combination of adjustments of C_5, C_4, and the coupling between L_4 and L_5.

When tuning up the two amplifier stages the signal should be constantly checked in the monitor. The change in plate current as the tuning

[3] "Neutralizing Radio Frequency Amplifiers," p. 31, October, 1930, *QST*, and Chap. VII, *Radio Amateurs' Handbook*, 7th and 8th Editions.

condensers are moved through resonance should be smooth; a sharp change in plate current at any point usually indicates that one or both of the amplifiers is breaking into oscillation of its own. Such oscillations can be picked out easily with the monitor, and if present must be eliminated by shielding between stages. A baffle shield between the final amplifier and the preceding stages should be sufficient.

As has been mentioned previously, there are two ways in which the set may be tuned on 7000 kc. The simpler method is to connect C_7 through the grid clip lead to the grid of the second '24 tube, plugging the 7000-kc. L_3 coil in the coil socket. The tuning is done in the same way as before; that is, C_3 is adjusted for minimum plate current with the milliammeter plug in J_3, and the final amplifier is neutralized and tuned in exactly the same fashion as on 3500 kc., except that the proper coils will be used, of course.

The alternative method is to connect C_7 to the grid of the first '24 and C_8 the grid of the second '24. The first tube then becomes the 7000-kc. doubler and the second an additional 7000-kc. amplifier. In this case the plug is first placed in J_2 and C_2 is adjusted for minimum plate current, which will be about 10 or 12 milliamperes. The plug is next placed in J_3 and C_3 is adjusted similarly. Again the amplifier tuning is the same. It may be advisable to increase the bias on the second '24 in this case, as the plate current on the tube is likely to be higher. This bias, connected to the post marked $-C_2$, may be approximately 90 volts.

When using this method of connection the amplifier should be carefully checked for signs of self-oscillation, because there are three tubes on the rather high frequency of 7000 kc. If it is impossible to prevent oscillation the first doubler should be omitted and only the second '24 used.

On 14,000 kc. all the tubes are in the circuit, and since each of the '24's is working on a different frequency, there is little likelihood of oscillation on this band. It is advisable to use 90 volts bias on the second '24 in this case, because the plate current may run quite high. The tuning process is the same as before; that is, each tuning condenser is adjusted for minimum plate current on the tube associated with it. The tuning lamp will be helpful in locating the bands, but should not be left near any of the inductances when final adjustments are made because it is likely to shift the tuning. As a rule the amplifier plate current will run between 25 and 35 milliamperes with the antenna disconnected on this band, and it will not be possible to load the tube beyond 60 or 70 ma.; because of the lower efficiency at this frequency.

The specifications for the coils may require some modification in different layouts. As a general rule it is best to use as much inductance and as little capacity as possible in each stage to get the greatest output. It is an easy matter to add or subtract a turn or two in case it is impossible to make one of the stages tune properly. The coil specifications under Fig. 1 will form a good starting point, and in fact may be found to work out without any change.

It should be possible for the chap who already has a self-excited Type '10 outfit to crystal control it by this method at comparatively small cost. With judicious buying the cost of the extra tubes, parts and power supply should not exceed $25 exclusive of the cost of the crystal and mounting. In many cases surplus receiver parts, such as are found in quantities in most amateur stations, will be available and may be used. For only one or two bands an even simpler layout can be used; for instance if the transmitter is to be used only on 3500 and 7000 kc. one of the doubler stages may be omitted. The transmitter as illustrated also will make a good exciter unit for larger tubes, and as such does not represent waste equipment if higher power is to be installed later, as might be the case if self-excited circuits were considered.

3500-KC. PHONE

A transmitter of this type is well suited to low-power 3500-kc. phone work. If used exclusively for 3500-kc. phone only three r.f. tubes are needed, a '27 oscillator, a '24 as a buffer amplifier, and the Type '10 as the modulated amplifier. In such a transmitter it is advisable to have plenty of physical separation between stages, and shielding of the buffer and oscillator stages is also recommended. These precautions will aid in preventing any energy in the amplifier stage from leaking back into the crystal oscillator and will thus improve the frequency stability of the transmitter.

A modulator unit which will work well with this outfit is described on page 14 of the September, 1929, issue of *QST*, and in the chapter on "Radiotelephony" in the Seventh and Eighth Editions of the *Handbook*.

The A.R.R.L. Board Meets

(*Continued from page 30*)

end to our squabbles on this question? We are entering now a most difficult time in our life as one group of radio amateurs, and in the months which are coming upon us we must stand solidly together.

Strays

W9IN finds that rubber nipples (swiped from the junior op's bottle) make good rain protectors for porcelain tube lead-in insulators. The bottle end of the nipple is slipped over the tube and the antenna wire goes through the hole that's intended to pass the milk.

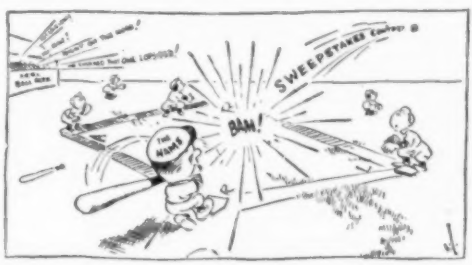
Results of the 1931 Sweepstakes Contest

All Sections Active in Second National Competition

By E. L. Battey, Assistant Communications Manager

BIGGER AND BETTER" is indeed appropriate to describe the Second All-Section Sweepstakes Contest, but it can never describe the keen enthusiasm of the participants and the pleasure and benefits they derived from the two weeks of "the most interesting operating they ever experienced."

From all quarters the "1931 Sweepstakes" has been acclaimed the "*biggest contest of recent years, national or international*" so far as national participation and interest is concerned! "Never had so much fun in all my life." "It was the most interesting two weeks that I have ever spent at the key." "The greatest contest that the A.R.R.L. ever sponsored." "I believe it is the most fascinating contest you conduct." "One of the most pleasant experiences that I have had in a long time." "I believe the benefits derived by the participants in a contest of this kind are manifold." "I enjoyed the contest very much, making more contacts and handling more messages than in any previous two weeks during the many years I have had a station." We could quote page after page of comments similar to the above, but the reader can judge for himself the attitude of the participants towards the "Sweepstakes." It "went over big."



The rules of the contest? They appeared in full in the February issue of *QST*. Anyone not already familiar with the requirements should dig out his copy and become acquainted with full particulars. It was a contest between individual stations, and was open to all amateurs in the sixty-eight A.R.R.L. sections throughout the United States and Canada, and including Hawaii, Alaska, the Philippines, Porto Rico, Cuba, etc. A station in any given section was competing only with all other stations *within that section*. Certificates were awarded only to the highest scoring station in each section. Even though there was no prize for having the highest score throughout all the sections, it proved a great deal of sport to strive to attain the leading total. The system of scoring was, briefly: A count of one point for each message received, and a count of one point for each message transmitted, making a total of two points for each QSO, if a message had been transmitted and received successfully. One message only could be exchanged each way with any one station, but exchanges could be made with as many stations as possible. Messages had to be transmitted in complete form with city of origin, station of origin, number, date, address, text and signature, the text being of no less than ten words (plain language count). Messages that did not comply with this rule were designated incomplete, and likewise the QSO on which they were exchanged was eliminated from the contest. If, therefore, a *bona-fide* exchange had been made, each QSO counted *two* points. That was only the beginning of the scoring! The total score made by exchanging messages was multiplied by the *number of sections* with which exchanges had been made. A possible multiplier of *68*. As new sections were added scores doubled, trebled, quadrupled; there was no stopping them.

Such scores have never before been heard of in any contest. The sum total of all scores is 885,541. With 276 stations listed on the score sheet this makes an average score of approximately 3208 per station!! *31* stations have scores over 10,000! Two are above 25,000 and two above 30,000!! Enough of that. Who are the high scorers? And who are the certificate winners?

W8CHC pounded away with vigor and determination, and came out in first place with the astounding total of 32,940!! He exchanged messages with 305 stations in *54 sections*. If you don't think that is getting about the greatest possible efficiency out of a one-man station, try it sometime! Congratulations, W8CHC! The four operators at W5WF "did themselves proud" and came in second with another eye-opening score — 32,016! And to W5WF goes the honor of making successful exchanges with the greatest number of sections — *58*, all but ten of the possible sixty-eight. The third highest and the station working the second greatest number of sections is W7AAT, a station with one operator that did most out-

standing work. 265 exchanges with *55 sections* brought W7AAT the score of 29,150 — nothing to be snickered at!

The Illinois Section leads all sections and the three ops at W9DGZ, backed by splendid team work in reporting scores throughout the Section, had no small part in putting her at the top. Exchanges with 235 stations in 54 sections gave

W9DGZ fourth place — 25,380. VE3GT is fifth high with 19,872, and is also the leading Canadian participant by many thousands of points. The operators of all certificate-winning stations should feel mighty proud of their accomplishments! The work of the five stations mentioned above, shows competition "fast and furious."

Eleven stations made successful exchanges with 50 or more A.R.R.L. Sections during the two weeks of the contest and are entitled to special mention because of such creditable work. They are here listed in order of number of sections: W5WF 58, W7AAT 55, W8CHC 54, W9DGZ 54, W6BJF 53, W6AQJ 53, W8BGY 51, W9BMA 51, W9ECZ 51, W3AMP 50, W9CPM 50. This shows mighty nice work, and the operators may well throw out their chests!

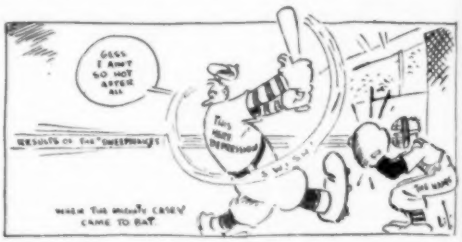
As a matter of record and for the information of all concerned we are listing below stations having scores above 10,000.

STATIONS WITH SCORES ABOVE 10,000

W8CHC, 32940	W2CUQ, 15364	W8BEN, 11880
W5WF, 32016	W9ECZ, 14892	W9CPM, 11600
W7AAT, 29150	W9BMA, 14688	W3SJ, 11592
W9DGZ, 25380	W2CEX, 14308	W1AVL, 11430
VE3GT, 19872	W6YU, 14076	W9DDB, 11180
W4GQ, 17484	W3AMP, 13600	W4GX, 11070
W6BJF, 16642	W8AXA, 13344	W8CMB, 10920
W8BGY, 16320	W7ACH, 12684	W6AM, 10752
W6AQJ, 16112	W9DGS, 12672	W9ERZ, 10584
W4MM, 15698	W2BUE, 12382	W5BBQ, 10464
	W3GS, 11968	

That certainly is *some list*. It will be noticed that all United States and one Canadian district are represented in the above list. While the work of the 31 stations listed deserves worlds of praise and admiration we must not lose sight of the fact that this was not a contest for *national high* place. It was a competition between stations within each A.R.R.L. Section. Any given station within a Section was competing only with all other stations *in his section*. Certificates of merit were to be awarded to the leading station of each Section. A study of the scores at the end of this article will show *64 sections listed*. Certificates have been awarded to the highest scoring station in *62* of these territories. No stations in the other sections submitted scores in accordance with the contest rules so no awards can be made.

A word as to the checking of logs and disqualification of those who failed to observe the rules might not be amiss at this point in our story. The usual variety of entries came in. Some were works of art and gladdened the hearts of the judges. Others were just the opposite, being nothing more than a conglomeration of messages and a pencil-scribbled log sheet jammed into an envelope. We were glad to get them all. Very, very few logs were found to check letter-perfect. Many scores were reduced considerably by the checking committee. Rule No. 4 (February *QST*) of the contest stated that all messages must be composed and transmitted in the proper form



with city of origin, station of origin, number, date, address, text (at least ten words, plain language count), and signature, and that unless they were so composed and transmitted the award committee would disregard such communications as "insufficient evidence of satisfactory two-way communication." Therefore, out of fairness to those who complied with the rules, any message lacking any of these essential parts was designated incomplete and the QSO on which it was exchanged was eliminated from the contest. In a few cases violations of Rule No. 4 cut scores in half! The greatest fault seemed to be carelessness of participants in preparing the copies of messages handled. It is better to submit original copies of message handled than to try to recopy them as that was found to be when most errors occurred.

Several stations not taking part in the contest sent in copies of messages handled to be checked and counted to help the stations they worked.

They have been given a score, and although they are not eligible for certificate awards, their scores will count for their respective sections. Such stations will be found marked with an asterisk in the list of scores. A number of stations submitted logs for consideration, but failed to give all the information required in the rules, such as time messages were received and sent. Of course these stations are ineligible for certificates, but in cases where the messages submitted were complete in every detail they have been given a score to count for their sections. They are marked with two asterisks. The following stations sent in messages to help out participants, but the messages were incomplete so scores cannot count for their sections: W1CSR, W1MO, W1QS, W1UZ, W2AOW, W2APZ, W2BEB, W2BKL, W2CZZ, W3HC, W6CEO, W6ZS, W7AFS, W8CMV, W9AMI and CM8YB. Three stations, W1BU, W9BBL and W9FNJ, submitted logs, but since their messages were incomplete, or insufficient information was given, they could not be considered for scores. Logs from W3AWV and K7ANQ were received late, so these stations were eliminated.

Again this year, as was the case with the 1930 Sweepstakes, low power stations were able to run up sizeable scores. W6CTP, certificate-winner in the San Diego section, used only a type '71A throughout the contest and came out with a total of 7878!! W8APQ placed third in Western Pennsylvania with his score of 4410, and he used only a type '01A with 230 volts on the plate on 3.5 and 7 mc., and a '12A on 14 mc.! W9DZK used two '71s with 200 volts. W5BMI had a lot of fun with a '45 with 250 volts on the plate. W9BVI ran up his score with a type '01A. Scores of contestants used type '10s. W3FJ says, "I am convinced that a judicious use of the bands plus operating skill will make up for any power that anyone lacks."

The 7000-kc. band was very popular during the Sweepstakes. Approximately 22% of all participants worked on 7000 kc. only. 23% divided their time between 3500, 7000 and 14,000 kc. 17% used 7000 and 14,000. 16% did their work on 3500 and 7000. 15% honored 3500 kc. only. Only 4% stuck to the 14,000-kc. band entirely. 2% chose the 3500–14,000 combination. And 1% used 3500–7000–1750. A bit of 'phone work was reported during the contest, mostly on the 14,000-kc. band.

Just a few side lights which may be of interest — VE2AC received 97 QSL cards as a result of the Sweepstakes! W8BPT, XYL, and W9GJX, YL, both submitted scores. W1OS and W8CNO, XYLs, were worked by several contestants. W9DDB's shack and everything in it including Sweepstakes files were destroyed by fire shortly after the contest. He submitted an affidavit swearing to his score, so his two weeks' labors did not go for naught. W1AVL worked one fellow who *didn't know what* ***QST*** *was!* And worse still, he worked another chap who, when asked to exchange messages, replied that he "had to take his wife for a ride" . . . and that at 2 a.m.!! It just isn't being done. W9ECI bet W1RV a pair of burned-out '81s against a 1924 call book that he would have the highest total. W1RV now has two tubes to throw away.

In conclusion we repeat the assertion made at the start of this article — "The 1931 Sweepstakes was the biggest contest of recent years, national

or international, so far as national participation and interest is concerned!" It is estimated that well over one thousand stations took part and, although not all reported for full credit, we know they enjoyed the radio work and contacts with good operators as fully as those whose expressions we have quoted here. As a measure of the fact that we have a live organization *throughout,* we may say that stations were active in *each of the 68 A.R.R.L. Sections* during the two weeks. This included stations in Alaska, Hawaii, Cuba, Porto Rico, the Philippines, Newfoundland, the Yukon and other remote points. That the contest was enjoyable is questioned by no one. It was also *beneficial* from the standpoint that it gave much practice and instruction in correct operating procedure. W9BVI writes, "I was an absolute beginner when I entered the contest; in fact I handled my first message on my third QSO. This taught me the proper message handling procedure." Many other operators were likewise benefited. W3AMP says, "A host of new friends was made, our spirit and interest in ham radio raised, and operation improved." All in all, "it was a peach of a contest." W3FJ sums it up well when he says, "It has proven a convincing illustration of the courtesy, coöperation and efficiency of the American amateur."

The list of scores follows. Stations are listed under their respective sections in order of their scores. The number of sections worked by each station is also listed. Whenever a station is known to have had more than one operator, the number of operators is shown in brackets with the call. Sections are listed according to their totals, the three highest being Illinois, Western New York and Western Pennsylvania. A summary showing the total scores for each Division and the leading Section in each Division is given at the end of the list of scores. How did your Section and Division come out?

RESULTS of the 1931 "SWEEPSTAKES" CONTEST

Section	Station	Number of Sections	Score	Section Score
Illinois	W9DGZ (3)	54	25380	
	W9ECZ	51	14892	
	W9ERZ	42	10584	
	W9CUO	34	4964	
	W9AFN	32	4608	
	W9ERU	30	3000	
	W9COB	22	1320	
	W9DGK	12	480	
	W9DWA	13	468	
	W9EAJ	11	418	
	W9FUL	12	336	
	W9CNY	7	126	
	W9ANQ	6	72	
	W9AA	3	30	
	W9QI*	3	24	
	W9BHW*	1	4	
	W9ATY*	1	2	
	W9CPQ*	1	2	
	W9ADN*	1	2	
				66712
W. New York	W8AXA	48	13344	
	W8BEN	45	11880	
	W8CVJ	35	7210	
	W8AIDG	40	6800	
	W8DUB	27	5670	
	W8BFG	20	1760	
	W8DSP	19	1292	
	W8AKC	11	506	
	W8BCN**	5	70	
				48532
W. Penna.	W8CHC	54	32940	
	W8DXO	38	5746	
	W8APQ	35	4410	
	W8AXD	19	2052	
	W8DLG	20	1440	
	W8ASE	17	816	
	W8AJU	11	264	
				47668
Los Angeles	W6AQJ	53	16112	
	W6AM	48	10752	
	W6CXW (2)	33	5808	
	W6SN	35	5110	
	W6BGF	30	2220	
	W6ID	20	1360	
	W6ETJ	15	960	
	W6AOA	9	396	
	W6CVZ**	10	340	
	W6ESA	7	112	
	W6BBO	5	50	
	W6DZH*	3	18	
				43238
E. Penna.	W3GS	44	11968	
	W3EV	30	7020	
	W3FX	27	5508	
	W3JR	40	5280	
	W3AIZ	31	4526	
	W8CWO	21	2478	
	W3NF	17	1530	
	W8DHT	17	986	
	W3AIH**	10	280	
	W3MC	8	192	
	W8CFI	7	126	
	W3HH*	7	126	
	W3MG	6	120	
	W3BES	1	2	
				40142
N. New Jersey	W2CEX (3)	49	14308	
	W2BUE	41	12382	
	W2CWK	38	7676	
	W2AI	24	3168	
	W2BHW	20	1120	
	W2BPY	13	728	
	W2CFY	9	630	
	W2AGO	5	60	
	W2AFB*	1	2	
				40074
Louisiana	W5WF (4)	58	32016	
	W5YW	32	4928	
				36944
Florida	W4GQ (3)	47	17484	
	W4MM (2)	47	15698	
	W4AKH	21	2268	
				35450
Washington	W7NM	42	8904	
	W7DF	41	6888	
	W7RT	19	4674	
	W7FA	29	4002	
	W7VN	27	2214	
	W7AIT	24	2016	
	W7KZ**	19	1026	
	W7TK	13	858	
	W7WU	9	612	
				31194
Ontario	VE3GT	48	19872	
	VE3BE	28	4424	
	VE3ZZ	23	3404	
	VE3RF**	25	2400	
	VE3AD	9	198	
				30298
Michigan	W8BGY (2)	51	16320	
	W8MV (2)	27	4914	
	W8DRD	22	2420	
	W9GJX	24	2112	
	W8PP	19	2014	
	W8COQ	19	1178	
	W8CPB	12	504	
	W8SH	12	432	
	W8BMG	7	196	
	W8DM	5	50	
	W8BPT	3	42	
	W8WG*	4	32	
	W8TJ*	3	18	
	W8AAF*	1	2	
				30234
S. New Jersey	W3AMP	50	13600	
	W3SJ	42	11592	
	W3UT	31	4030	
	W3BUF	12	456	
	W3JL**	8	224	
				29902
Montana	W7AAT	55	29150	
				29150
Missouri	W9BMA	51	14688	
	W9CU	34	4964	
	W9ECI	17	1020	
	W9CJB	18	900	
	W9DYJ**	12	696	
	W9EFC*	4	32	
	W9DZN	1	2	
				22302
E. Mass.	W1RV	38	9880	
	W1BXC	28	5712	

Section	Station	Number of Sections	Score	Section Score
	W1ALA	29	3422	
	W1CHR	15	1020	
	W1ME	14	560	
	W1CTG**	6	84	
	W1CQN	3	36	
	W1BFR*	1	2	
				20716
Connecticut	W1ZY (4)	36	7128	
	W1CDS	21	2814	
	W1CLH	26	2444	
	W1AFB	24	2208	
	W1MK	24	1632	
	W1BVW	16	1120	
	W1UE	16	608	
	W1BDI	13	468	
	W1DF	11	392	
	W1APJ	11	352	
	W1AVB	8	240	
	W1AZG**	8	192	
	W1CJD**	8	144	
	W1CTI	5	80	
	W1QV	3	18	
	W1BNB*	1	2	
	W1BNP*	1	2	
				19844
Ohio	W8CMB	39	10920	
	W8BZB**	35	6360	
	W8CZC	8	208	
	W8CGS	9	198	
	W8CSS	8	160	
	W8DIH	6	108	
	W8BMA*	2	8	
	W8CYI*	1	2	
	W8BYG*	1	2	
				17966
Wisconsin	W9FAW	43	9718	
	W9EYH	31	4030	
	W9CER	30	2820	
	W9BRR	18	792	
	W9ABM	10	300	
	W9FHU	7	112	
				17772
Virginia	W3HY	39	6162	
	W3FJ	30	5940	
	W3AEW	31	3286	
	W3ARU	16	864	
	W3CFL	16	672	
				16924
Arizona	W6BJF	53	16642	
	W6BLP	7	112	
				16754
Oregon	W7ACH	42	12684	
	W7AEB	21	3486	
	W7LK	13	468	
	W7AME	5	100	
	W7ATC*	1	2	
				16740
N.Y.C.-L.I.	W2CUQ	46	15364	
	W2ABP	9	234	
	W2BQK	6	84	
	W2ADB*	1	2	
				15684
New Hampshire	W1AVL	45	11430	
	W1IP	22	2420	
	W1CAF	20	1160	
				15010
Santa Clara V.	W6YU	46	14076	
	W6DBB	11	616	
	W6DCP	6	168	
				14860
North Dakota	W9DGS	44	12672	
	W9CRL	6	144	
				12816
So. Minnesota	W9CPM	50	11600	
	W9AIR	8	240	
	W9FJK	5	70	
				11910
Tennessee	W4GX	41	11070	
	W4RO	12	408	
				11478
No. Carolina	W4JR	44	8888	
	W4AAE	18	1044	
	W4ABW**	19	1026	
	W4FT*	12	288	
	W4ACP*	3	18	
				11264
Indiana	W9DDB	43	11180	
	W9GJS	4	40	
	W9AIP	4	40	
				11260
No. Texas	W5BBQ	48	10464	
	W5QU	17	714	
				11178
Kansas	W9GHI	35	6160	
	W9FXY	21	1722	
	W9GKT	8	128	
	W9HL-FLL*	3	24	
				8034
San Diego	W6CTP	39	7878	
				7878
Colorado	W9DOC	31	4278	
	W9YQ (2)	29	3016	
	W9CVE	12	384	
				7678
W. Virginia	W8ANV	33	3762	
	W8TI (2)	27	2106	
	W8BTV	25	1650	
				7518
San Francisco	W6DOT	18	1656	
	W6DWJ	21	1512	
	W6DZQ	14	1036	
	W6BNA	12	648	
	W6CAL	15	570	
	W6DZZ	13	520	
	W6CIS	8	208	
				6150
Arkansas	W5ASG	36	4824	
	W5BMI	20	1000	
				5824
East Bay	W6BPC	33	5808	
				5808
Alabama	W4AG	36	4968	
	W4DS	13	650	
	W4EA*	3	18	
				5636
Saskatchewan	VE4CV	35	5390	
				5390
W. Mass.	W1AZW	28	2912	
	W1ZB	22	1628	
	W1ASY	15	660	
	W1CNE*	2	8	
				5208
Idaho	W7KA	32	4288	
	W7AKZ	6	396	
				4684
Mississippi	W5BUI	33	4488	
	W5BNW	5	70	
	W5MC*	1	2	
				4560

Section	Station	Number of Sections	Score	Section Score
Quebec	VE2AC	35	4550	4550
Oklahoma	W5OJ	22	2112	
	W5AMC	22	1408	
	W5BOE	16	896	4416
Iowa	W9DBW (2)	31	3100	
	W9AHX	7	182	
	W9EOP	6	120	3402
San Joaquin	W6FFP	23	1656	
	W6CLP	20	1360	3016
Manitoba	VE4IC	27	2484	2484
E. New York	W2CBB	19	1672	
	W2BJA	13	702	
	W2FN*	4	40	
	W2CC	2	8	2422
No. Minnesota	W9DOQ**	21	1218	
	W9GCZ	15	900	
	W9BVI	7	168	2286
Kentucky	W9DDQ	21	1806	
	W9CNE	12	456	2262
Maine	W1EF	19	1558	
	W1ANH	13	520	2078
Nebraska	W9DTX	22	1540	
	W9DZK	10	500	2040
Md.-Del.-D. C.	W3AOO	18	1260	
	W3OZ	11	330	
	W3AI*	2	8	1598
Sacramento V.	W6CGJ	17	1598	1598
South Dakota	W9DKL	19	988	
	W9FLI	3	24	1012
Brit. Columbia	VE5AW	14	784	
	VE5EC	4	64	
	VE5AM	3	27	875
New Mexico	W5AHI	12	528	
	W5BQE	11	286	814
Utah-Wyo.	W6DPJ	16	640	640
Nevada	W6CDZ	13	624	
	W6UO*	2	8	632
Hawaii	K6ALM	10	420	
	K6CCS*	2	8	428
Rhode Island	W1BUX	10	220	
	W1DW	6	72	
	W1AAD*	3	18	310
Ga.-S. C.-etc.	W4SS	9	198	
	W4RM	5	60	
	W4WD	1	2	260
So. Texas	W5TD*	4	32	32
Maritime	VO8J*	1	2	2

SWEEPSTAKES STANDING BY DIVISIONS

Atlantic led by Western New York (48532)	167842
Central led by Illinois (66712)	146206
Pacific led by Los Angeles (43238)	100362
Northwestern led by Washington (31194)	81768
New England led by Eastern Massachusetts (20716)	63166
Delta led by Louisiana (36944)	58808
Hudson led by Northern New Jersey (40074)	58180
Southeastern led by Florida (35450)	41340
Midwest led by Missouri (22302)	35778
Roanoke led by Virginia (16924)	35706
Ontario	30298
Dakota led by North Dakota (12816)	28024
West Gulf led by Northern Texas (11178)	16440
Rocky Mountain led by Colorado (7678)	8316
Prairie led by Saskatchewan (5390)	7874
Quebec	4550
Vanalta led by British Columbia (875)	875
Maritime led by Newfoundland (2)	2
Total Scores	885540

"Five Meter" Receiver Progress

(*Continued from page 25*)

often to R_9. From then on, the signals were heard continuously up to approximately 35 miles. This was obviously not the DX limit, however.

(f) The poorest signals usually were heard when the receiver was close under the "shadow" of an intervening hill. The presence of such hills at more than a mile or so from the receiver did not appear to have much influence on signal strength. Quite the best signals at any appreciable distance from the transmitter were heard on the far side of a large lake just across the Massachusetts border. In this case, the approach to the receiver was across a mile or two of water.

The chief deduction arrived at from these short receiving tests, as far as amateur work is concerned, is that in the 56-mc. band we really have a valuable piece of territory for short-haul phone work. It is at once obvious that a small 56-mc. transmitter and receiver, auxiliary to the usual amateur equipment, could be of great value in around-the-town and inter-town communication. Because of the limited range, interference is not likely to be a real problem (for the present at any rate) while contacts, short-haul though they may be, have a better chance of being 100 per cent reliable day and night than on any other band.

This story is just a starter. Our results, obviously, are incomplete. But there is more — much more, we hope — to come.

Strays

The "grasshopper" fuses used in telephone exchanges are excellent for protecting mercury-vapor rectifier tubes. They are rated at about 1 or 1.3 amperes.

— *W9DOE*

Standard Frequency Service Has World-Wide Coverage

Frequency Measurement Contest Coming—Future S. F. Schedules

A SURVEY of the reports received from users of the A.R.R.L. Standard Frequency Transmissions since the three-station network got going full blast last winter brings out some decidedly interesting and illuminating facts. Some of them are surprising and gratifying; and some of them are not so surprising and not at all gratifying. Let's look at the bright side first.

The reports have come from practically every nook and corner of the world, some of them from places where reception of the signals would hardly be expected. Many European countries, including the U.S.S.R. (Russia), South Africa, Australia, New Zealand, and the Malay States are represented. Amateurs in the British Isles have been having good luck with W1XP's transmissions on all three bands while other foreign reports indicate the best results with the 7- and 14-mc. transmissions of W1XP and W6XK. One striking feature is the apparent consistency with which W1XP's Schedule BB, transmitted on 7 mc. at 2100 G.C.T. (4:00 p.m., E.S.T.) is being received by Australian amateurs. This is breakfast time for the VK's and the signals seem to go the long way around, eastward from our Atlantic coast. It is suggested that more of the gang "down under" look for this transmission and report on its reception.

And now for the darker side. The situation in the U. S. A. is not altogether encouraging. While there has been a steady increase in the number of reports received from all over the United States and Canada, especially in the number of "first timers" requesting reporting blanks, there still seems to be an amazing lethargy afflicting large numbers of American hams. Some localities apparently have more than their share of these frequency-unconscious individuals; and it is no coincidence that these same localities from which the fewest proportionate S.F. reports come are the very ones in which a disproportionate share of the off-frequency signals originate. A comparison of the S.F. survey figures with the Communication Department's files of band-jumpers shows this conclusively. Stations that report regularly on the S.F. transmissions are not found listed in the off-frequency reports.

What can be done about it? The three Standard Frequency Stations are doing everything they can, transmitting accurate calibration signals for everyone that will use them — doing it month in and month out with no recompense for their services but the gratitude of organized radio and the written thanks of a relatively few individual hams; the League's field representatives are doing their darndest by every possible way to get the whole gang to stay in the bands and make use of the means provided to do it; *QST* is continually publishing the S.F. schedules and information on practical and simple frequency meters that leave no excuse for any station being without adequate frequency measuring equipment. What more can be done? Dr. R. H. Baker, W5BTL, gave us an idea in his letter published in May *QST*, and we are going to try it.

FREQUENCY MEASUREMENT CONTEST

Some time during October there is going to be a frequency measurement contest. Complete details have not been worked out at this time, but here are the essentials:

Every amateur having a frequency meter will be eligible. Every contestant will have a chance to win one of the Certificates of Accuracy that will be issued to those who measure the official contest signals within the prescribed reasonable degree of accuracy. You will need a good frequency meter, such as the dynatron type that has been described in several *QST* articles and in the Radio Amateur's Handbook (7th and 8th Editions); and you will have to have it accurately calibrated. Now is the time to get started. Build the frequency meter. Become an expert at frequency measurement by constant practice. Use as many standard frequency transmissions as possible.

Here are the schedules for July and August. It won't be too early if you start on them.

DATES OF TRANSMISSION

July 3, Friday	A	W1XP
	B	W9XAN
	B	W6XK
July 10, Friday	BB	W1XP
	B	W9XAN
	A	W6XK
July 11, Saturday	BX	W6XK
July 12, Sunday	C	W9XAN
July 17, Friday	BB	W6XK
	B	W1XP
	A	W9XAN
July 19, Sunday	BB	W9XAN
	C	W6XK
July 24, Friday	C	W6XK
July 26, Sunday	C	W1XP
July 31, Friday	A	W1XP
	B	W9XAN
	B	W6XK

Aug. 7, Friday	BB	W1XP
	B	W9XAN
	A	W6XK
Aug. 8, Saturday	BX	W6XK
Aug. 9, Sunday	C	W9XAN
Aug. 14, Friday	BB	W6XK
	B	W1XP
	A	W9XAN
Aug. 16, Sunday	BB	W9XAN
	C	W6XK
Aug. 21, Friday	C	W6XK
Aug. 23, Sunday	C	W1XP
Aug. 28, Friday	A	W1XP
	B	W9XAN
	B	W6XK

STANDARD FREQUENCY SCHEDULES

Friday Evenings Schedule and Frequency			*Friday and Sunday Afternoons Schedule and Frequency*		
Time (p.m.)	*A*	*B*	*Time (p.m.)*	*BB*	*C*
	kc.	*kc.*		*kc.*	*kc.*
8:00	3500	7000	4:00	7000	14,000
8:08	3550	7100	4:08	7100	14,100
8:16	3600	7200	4:16	7200	14,200
8:24	3700	7300	4:24	7300	14,300
8:32	3800		4:32		14,400
8:40	3900				
8:48	4000				

Saturday Morning Schedule and Frequency	
Time (a.m.)	*BX*
	kc.
4:00	7000
4:08	7100
4:16	7200
4:24	7300

The time specified in the schedules is *local standard time at the transmitting station.* W1XP uses Eastern Standard Time, W9XAN, Central Standard Time, and W6XK, Pacific Standard Time. Schedule BB transmitted by W1XP is intended particularly for European amateurs and starts at 2100 G.C.T. Schedule BX is transmitted especially for amateurs in Oceania and the Far East. It is transmitted starting at 1200 G.C.T. by W6XK. Reports on these special schedules are particularly desired, not only from overseas hams but from those in the Americas.

Although the frequencies of the transmitting stations are not guaranteed as to accuracy, every effort is made to keep to within 0.01% of the announced frequencies. The frequency standards are calibrated against the National Frequency Standard. Frequent checks on the transmissions are made by laboratories equipped with accurate frequency standards and the transmissions are also checked by the U. S. Department of Commerce monitoring stations.

TRANSMITTING PROCEDURE

The time allotted to each transmission is 8 minutes, divided as follows:

2 minutes — QST QST QST de (station call letters).

3 minutes — Characteristic letter of station frequency by call letters and statement of frequency. Characteristic letter of W1XP is "G," of W9XAN is "D," and of W6XK is "F."

1 minute — Statement of frequency in kilocycles and announcement of next frequency.

2 minutes — Time allowed to change to next frequency.

THE TRANSMITTING STATIONS

W1XP: Massachusetts Institute of Technology, Round Hill Research, South Dartmouth, Mass., Howard A. Chinn in charge.

W9XAN: Elgin Observatory, Elgin National Watch Company, Elgin, Ill., Frank D. Urie in charge.

W6XK: Don Lee Broadcasting System, Los Angeles, Calif., Harold Peery in charge.

REPORTS

Handy blanks for recording and reporting the transmissions can be had for the asking. Just drop a card or send a message to Hq. asking for s.f. report blanks and they will be sent postpaid. When you receive a transmission be sure to send in a report addressed to the A.R.R.L. Standard Frequency System, *QST*, West Hartford, Conn. After a record of the report has been made at this office it will be forwarded to the proper transmitting station.

5000-KC. SIGNALS FROM WWV

Calibration signals will be transmitted on the single frequency of 5000 kc., accurate to within 1 part in a million, by the Bureau of Standards station, WWV, between 2:00 and 4:00 p.m. and between 10:00 p.m. and 12:00 midnight on each of the following Tuesdays: July 14th, 21st and 28th; Aug. 11th, 18th, and 25th. Schedules of additional multi-frequency transmissions from this station will appear in August *QST*. Reports on WWV signals may be forwarded via A.R.R.L., West Hartford, Conn.

— *J. J. L.*

Strays

When building a receiver with r.f. amplifiers a milliammeter inserted in the plate circuit of the r.f. tube will help locate troubles. If the amplifier oscillates or if there is any interlocking between stages the meter will dip as the tuning controls are varied. The effect of any adjustments can be gauged immediately.

— *W. N. Steiner*

W1AJW ran into a curious trouble with his receiver. Movement of people in certain parts of the room or a change in the position of the operator would cause the tuning of the set to vary, and at the same time set up all kinds of racket. Grounding a hot air pipe running along the cellar ceiling cured it.

New Six-Volt D.C. Tubes

A Newly Developed Group of Tubes Which Shows Promise for Amateur Receivers

By George Grammer, Assistant Technical Editor

THIS has been a great year for the tube crop. So many new types have blossomed forth during the past few months that it's beginning to be a job to remember the numbers of even a small portion of them. Add three more to the list; the 236, 237 and 238. These are RCA designations; as usual, we may expect that other manufacturers will retain the last two figures and put their own "first figures" on them, so that the general types will have to be known as the Types '36, '37 and '38.

This latest group of tubes has some features which are new to the American market. They are the first indirectly heated cathode tubes made in this country for d.c. operation. Intended primarily for automobile sets, they are ruggedly constructed and look as though they should be non-microphonic. The loud-speaker tube, the 238, is a pentode, and is about the only audio power output tube with cylindrical elements, and incidentally is the only power tube for either a.c. or d.c. heating which has an indirectly heated cathode. Last, but perhaps not least, in meeting the need for a group of tubes suitable for automobile radio sets the demand for good tubes for 110-volt d.c. receivers has also been satisfied.

As might be expected from the present status of receiver design, the new group of tubes comprises a screen-grid amplifier, a general-purpose tube for detection, amplification, or oscillation, and an audio power output tube. These are known as the 236, 237 and 238, respectively. The general appearance of the tubes is shown in the photograph; they resemble the older types except that the envelope is noticeably smaller than is the case with the Type '27, '24, etc. The bases are the small UY type. Pin connections for the 236 and 237 are the same as the '24 and '27. The pin connections of the 238 pentode correspond to those of the '24, the space-charge grid taking the place of the screen-grid. The control-grid is brought out to the cap on top of the tube.

The heaters are designed to operate from a six-volt storage battery without a rheostat. The cathodes have been constructed so the emission is ample for satisfactory operation of the tubes over the entire range of battery voltage from full charge to normal discharge. Practically this means that the heater voltage may be anything between 5.5 and 8.5 volts without noticeable effect on the operation of the tubes. The heater current is only three-tenths of an ampere, little more than the current taken by a Type '01-A tube; consequently the battery discharge rate is not unduly high. The heaters are of the "straight-through" type — a single filament concentrically located in the cathode sleeve — and since no provision has been made for hum cancellation the tubes are not particularly suitable for a.c. heater operation.

Tentative ratings and characteristics of the tubes are shown in the following tables. Some of the similar types of tubes are also shown for purposes of comparison.

Screen-Grid Tubes

	Type '36	*Type '32*	*Type '24*	*Type '22*
Heater voltage	6.3	2.0*	2.5 (a.c.)	3.3*
Heater current	0.3	0.06	1.75	0.132
Plate voltage	135	135	180	135
Screen voltage	75	67.5	90	67.5
Grid bias	−1.5	−3.0	−3.0	−1.5
Plate current	3.5	1.4	4.0	3.3
Screen current	Not over ⅓ of plate current			
Plate resistance	250,000	1,150,000	400,000	600,000
Amplification factor	275	580	400	290
Mutual conductance	1100	505	1000	480
Approx. inter-electrode capacitances, μμfd.				
Grid-plate	0.01	0.02	0.01	0.025
Input	4	5.8	5.0	3.2
Output	9	11.4	10.0	12

General Purpose Tubes

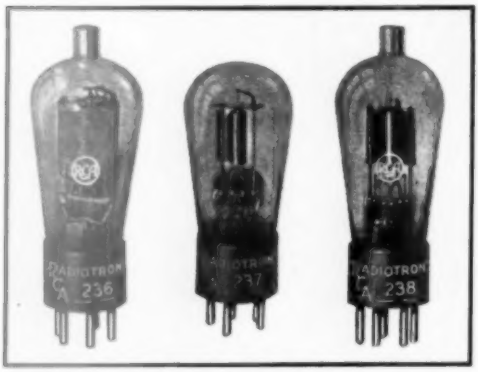
	Type '37	*Type '27*	*Type '01-A*
Heater voltage	6.3	2.5 (a.c.)	5.0*
Heater current	0.3	1.75	0.25
Plate voltage	135	135**	135
Grid bias	−9.0	−9.0	−9.0
Plate current	−4.5	4.5	3.0
Plate resistance	10,000	9000	10,000
Amplification factor	9	9	8
Mutual conductance	900	1000	800
Optimum load resistance	12,500	No data	
Undistorted power output	.74mw	80mw.	55mw.
Approx. inter-electrode capacitances, μμfd.			
Grid-plate	2.0	3.3	8.1
Input	3.3	3.5	3.1
Output	2.3	3.0	2.2

	Type '38 Pentode
Heater voltage	6.3 volts
Heater current	0.3 amp.
Plate voltage	135 volts
Screen voltage	135 volts
Grid bias	−13.5 volts
Plate current	8 ma.
Screen current	2.5 ma.
Plate resistance	110,000 ohms
Amplification factor	100
Mutual conductance	900 μmhos
Load resistance	15,000 ohms
Undistorted power output	375 mw.

* Filament-type directly-heated cathode.

** 135 volts given here for comparison. Maximum recommended voltage is 180.

From the tables already given the 236 appears to be the "best" of the screen-grid tubes, having the highest mutual conductance and the lowest plate resistance. It certainly appears to be far better than the Types '22 and '32. The Types '37 and '27 are very nearly alike in essential



The NEW "AUTOMOBILE RADIO" TUBES

Indirectly heated cathodes, designed to operate from a six-volt storage battery, are one of the interesting features of these tubes. A screen-grid amplifier, general-purpose triode, and an audio pentode comprise the group.

characteristics, with the '27 perhaps a shade better. It is reasonable to expect about equal performance from the two tubes in amateur receivers. The '01-A, now rapidly dropping out of the radio picture, is not quite up to either of the other two.

There is no other audio output tube which can be directly compared with the 238. The undistorted power output is about the same as that of the '71-A at 135 volts, but this output is secured with a much smaller grid swing and with considerably greater economy of plate power than with the '71-A. The 238 will produce about the same volume as the '71-A with about half the signal voltage and slightly more than half the plate current required by the '71-A, assuming the circuits to be properly adjusted.

At first thought the possibility of using the 238 in the audio stage of an a.c. receiver looked interesting, and one of the tubes was tried with a.c. on the heater. The hum was somewhat greater than with a '27, but no doubt could be reduced to a negligible amount with care in laying out the circuit. No attempt was made to secure the proper plate load for either tube, the phones simply being inserted in the plate circuits as is done in most amateur receivers. The '38 showed a just barely perceptible increase in signal strength over the '27, however, so that there is no particular reason for thinking that it will replace the latter tube in amateur receivers. Although for a given signal the '38 will give somewhat more than twice as much power output as the '27, it takes a healthy increase in power to make a noticeable increase in signal strength. There was a quite marked increase in the background noise with the pentode in this test due, no doubt, to its tendency to produce high-harmonic distortion.

The new tubes undoubtedly should find application in amateur receivers, especially those employing a six-volt storage battery for filament heating. The characteristics of the tubes are superior to those of tubes commonly used in storage-battery sets, and it is possible that there may be a noticeable gain as the result of changing over.

Financial Statement

BY order of the Board of Directors the following statement of the income and expenses of the American Radio Relay League, Inc., for the first quarter of 1931 is published for the information of the membership.

K. B. Warner, *Secretary.*

STATEMENT OF REVENUE AND EXPENSES FOR THE THREE MONTHS ENDED MARCH 31, 1931

REVENUE		
Advertising sales, *QST*	$15,706.88	
Newsdealer sales	12,397.02	
Beginners' Booklet sales	2,024.55	
Handbook sales	10,359.67	
Advertising sales, Handbook	425.00	
Membership dues	13,222.13	
Emblems	48.98	
Miscellaneous sales, net	1,280.54	
Interest earned	916.02	
Cash discounts earned	386.62	
Profit, sale of equipment	142.50	
		$56,909.91
Deduct:		
Returns and allowances	$3,313.18	
Provision for newsstand returns	1,123.62	
Cash discount on sales	281.70	
Exchange and collection charges	40.16	
		4,758.66
Net revenue		$52,151.25
EXPENSES		
Publication expenses, *QST*	$14,230.48	
Publication expenses, Handbook	3,590.41	
Publication expenses, Beginners' Booklet	1,082.23	
Salaries	19,063.59	
Forwarding expenses	635.22	
Telephone, telegraph and postage	2,812.93	
Office supplies and general expenses	3,406.50	
Rent, light and heat	1,143.71	
Traveling expenses	609.59	
Depreciation on furniture and equipment	277.75	
Bad debts charged off	6.50	
Communications Department field expenses	74.62	
Headquarters Station expenses	110.37	
Total expenses		47,043.90
Net gain from operations		$5,107.35

Strays

New song dedicated to ham operators, with apologies to Rudy Vallee: "Ninety-nine out of a hundred wouldn't be missed. How about you?"
— *W9FO*

EXPERIMENTERS' SECTION

Help Wanted

Here's an extract from a letter from W2WD that looks like a good suggestion:

"Why not have a symposium arranged from the solicited answers of amateurs on the general subject of increasing the ratio between signal strength and background noises — and the perennial question of eliminating static, or at least of reducing it to some extent?"

At this time of the year there's certainly plenty of background to be reduced, and anything new along these lines will be welcome material for the "X" Section. Some of the stunts that have proved to be effective are doublet receiving antennas, peaked audio amplifiers, limiting devices such as audio amplifiers working at low plate voltage, "volume control" tubes adjusted for filament or plate saturation, etc. But there's still lots of room for improvement.

Some of you experimenters should have ideas along different lines which look as though they might work out. How about giving them a whirl and giving us the dope if they show possibilities? Even a small improvement is worth while.

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Improving Power Supply Regulation

The keying scheme shown in Fig. 1 is used by W9CHA, Ben J. Biederwolf, Evansville, Indiana, to eliminate the voltage rise encountered with

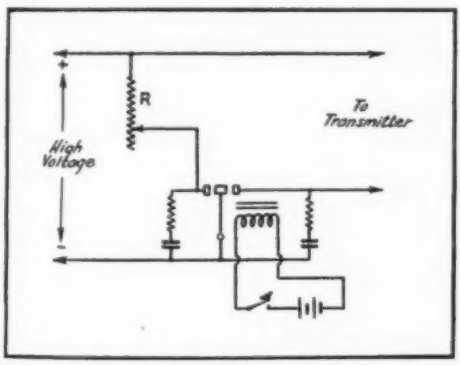

FIG. 1

most rectifier-filter systems when the load is thrown on and off with keying. A back-contact relay is required, but this need offer no difficulty because W9CHA made one which works very satisfactorily from an old telegraph sounder.

The variable resistor *R* is adjusted so that the same current flows through it as is taken by the tubes when the transmitter is adjusted for normal operation. This resistor must therefore be capable of dissipating the same amount of power as is used on the tubes — possibly 50 or 60 watts with a pair of '10's. The advantage of this system over the more common bleeder resistor is that no power is being wasted in the resistor when the key is closed; furthermore the voltage on the tubes cannot vary at all — as it will with most bleeder resistors — if the relay contacts are adjusted so that one circuit closes at practically the same instant that the other one opens. The filter condensers will not charge to an appreciably higher voltage during the short time required for the armature to move from one contact to the other.

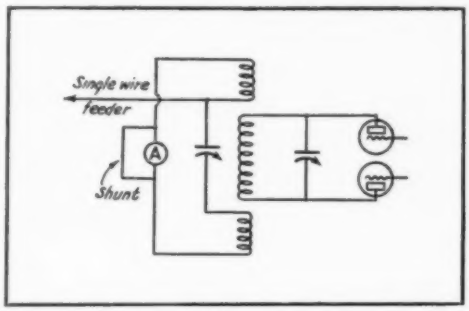

FIG. 2

The condensers and resistors across each set of contacts serve to eliminate sparking. A half microfarad with two or three hundred ohms in series will usually be about right.

— - - - —

Tuning the Oscillator to the Antenna

An r.f. ammeter is of little value with single-wire feeder systems, especially with low power transmitters, because the current is very small. Some other method must be used to adjust the transmitter to resonance with the antenna.

In the writer's push-pull transmitter using two Type '10 tubes coupled to the feeder through an antenna tank, an r.f. ammeter of 2-amp. range was connected in the antenna tank and shunted with a copper strip cut so the meter read full scale with the feeder disconnected. The circuit is shown in Fig. 2.

The transmitter was then adjusted to various frequencies across the band, noting the *difference* in the current with the feeder connected and disconnected. After each change of the plate tank

condenser the antenna tank is tuned to obtain the highest current with the feeder off; then the feeder is connected and the point where the largest *difference* is found is the proper adjustment for maximum radiation.

Finally, using the monitor, slightly detune to clear up the note.

— *L. S. Fox, W2AHB*

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Three-Phase Self-Rectification

In the January Experimenters' Section there was published a circuit suggested by W2ZC, Harold Churchill, Little Silver, N. J., for using self-rectification on a power amplifier following a crystal-controlled oscillator or preceding buffer amplifier, the plates of which were fed d.c., the

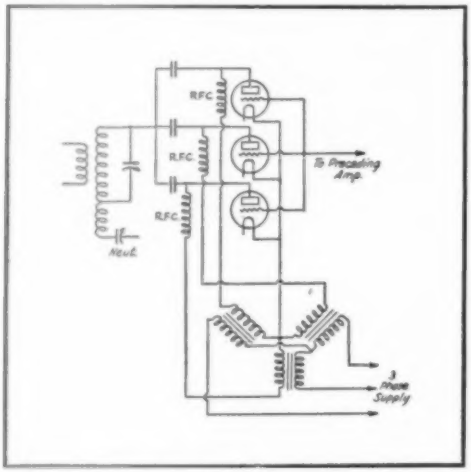


FIG. 3

object being to save expense of high-voltage rectifiers and filters. Here is another letter from W2ZC describing an extension of the idea:

"Since publication of the back-to-back crystal amplifier circuit in January *QST* I have been flooded with numerous requests for dope, information and the saving possibilities of this circuit. It might be of interest to the gang to try out a new type of this amplifier, rather tricky in its performance.

"Three-phase supplies are quite frequently available to hams who do not take advantage of them. Here is a back-to-back crystal amplifier similar to the Army system but perfected into a three-phase set-up using either three Type '52's or three Type '10's (see Fig. 3). The note is almost pure d.c. — a suggestion of violin in the background. The power output is somewhat more than that obtainable from a single tube and the note really sounds great.

"Am sure some of the gang interested in self-rectified amplifiers would like to try this three-phase job. It's electrically very pretty and sure works FB."

Three single-phase transformers or one three-phase transformer will be required. The star connection of the secondaries is necessary to provide a negative return for the tubes, but the primaries may be connected either delta or star.

— - - - —

Key Thump Filters

Several readers of the "X" Section have written in recently to suggest key-thump filters in which the choke has been split in two sections, one on each side of the key, instead of a single choke. One of these, due to W7AAT, O. W. Viers, Red Lodge, Montana, is shown in Fig. 4. The values of the various chokes and condensers are shown under the diagram. Not everyone may have the particular chokes shown but no doubt other small iron-core inductances could be substituted with equal success. Probably a single variable resistor could be substituted for R_1

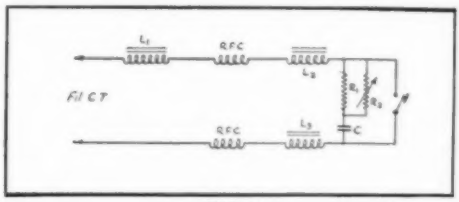


FIG. 4

L_1—Magnet from old 75-ohm telephone receiver.
L_{2-3} — Telephone induction coils.
C — 2 μfd.
R_1 — 400 ohms.
R_2 — Bradleystat E-210 or any variable resistor with a range of about 150 ohms.
RFC — 3-inch winding of No. 28 d.c.c. on ¾-inch form.

and R_2. W7AAT has used this arrangement successfully with several different types of transmitters. Sparkling at the key contacts is completely eliminated, and there is no trace of thump in nearby broadcast receivers.

The hook-up in Fig. 5 is used by both W2BLU and W8BOO with excellent results. The values used at each station vary somewhat, showing that there is nothing particularly critical about the circuit. W2BLU keys in the filament center-tap, and both L_1 and L_2 are double chokes taken from a Philco power-pack. The condenser C is 2 μfd. or more, and the resistor R is anything that works. A variable resistor of 500 ohms or so should be O.K. In W8BOO's outfit L_1 is a 5-henry choke and L_2 is 30 henrys. Condenser C is 1 μfd. and R is 50 ohms.

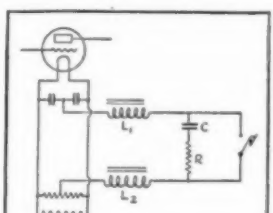


FIG. 5

Homemade 50-Watt Sockets

Figs. 6 and 7 show two ways of making inexpensive sockets for 50-watt tubes. Fig. 6 was suggested by P. W. Moor, W3BER, who writes as follows concerning it:

"While collecting parts to add a 50-watt

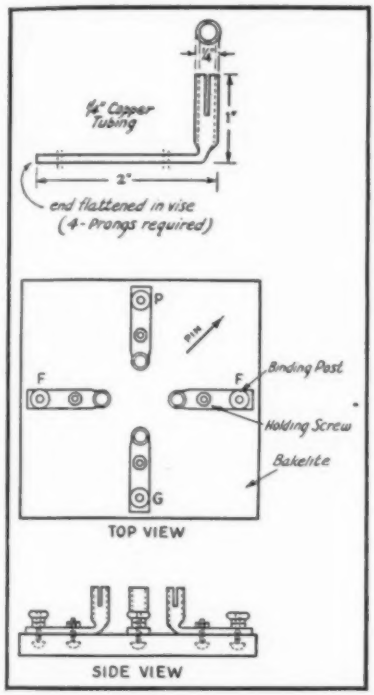


FIG. 6

amplifier to my transmitter *à la* February *QST* it became evident that a socket for the 50-watt tube would be required. A dollar or two was saved by using about one foot of ¼" copper tubing and eight brass machine screws and nuts for binding posts. A piece of bakelite and about an hour's work were then all that were required to make what appears to be an entirely adequate socket. Procedure is as follows:

1. Cut four pieces of tubing each 3" long.
2. Place in vise with about 1" extending beyond jaws and flatten the remaining two inches of tubing.
3. Bend tubing at right angles at end of flat part.
4. Cut slot in round portion with hack saw.
5. Place on prongs of tube and then mark position of flat portion on bakelite base.
6. Drill and countersink two holes for each prong.
7. Adjust tension on prongs by pinching slotted end of tubing with pliers.

"With reasonable care a very neat socket resembling one of well-known manufacture can be made."

The socket shown in Fig. 7 is perhaps even less trouble to make. E. C. Lockwood, W8DUF, originated this one. A square piece of insulating material such as formica or bakelite, four battery clips, four ½" x ⅜" brass angles and four binding posts are the parts required. The diagram explains very clearly how the parts are

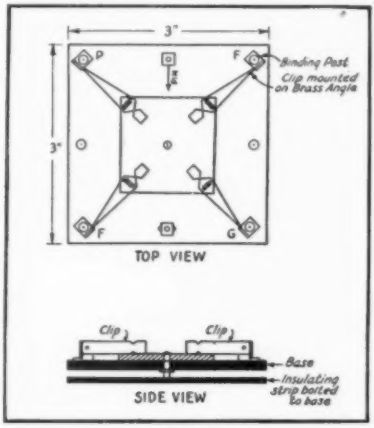


FIG. 7

assembled. A small square of formica bolted to the center of the base prevents sagging of the clips when the tube is in place.

A similar socket for larger tubes such as the 212-D can be made by using larger clips and larger dimensions.

Self-Neutralization

An interesting circuit for self-neutralization of a power amplifier when two tubes are used in a "back-to-back" self-rectified system is brought to our attention by Russell Dunaja, W3BBF, who writes:

"While looking over the January issue of *QST* I noticed in the Experimenters' Section a dia-

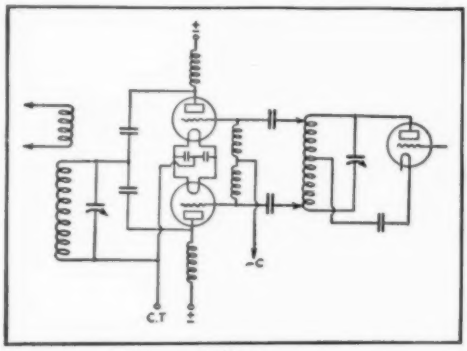


FIG. 8

gram of an a.c. full-wave self-rectified power amplifier which was neutralized by means of a neutralizing condenser.

"I wish to inform you that in a self-rectified amplifier the neutralizing condenser is not necessary as the circuit can be made self-neutralizing. In the self-rectified set only one tube works at a time (on the positive half of the cycle, the other tube being inactive) and the inactive tube may be used as a neutralizing capacity for the active one.

"Figs. 8 and 9 show two diagrams of a full-wave self-rectified self-neutralized power amplifier.

"These circuits are used by the U. S. Lighthouse Service in their 200-watt M.O.P.A. transmitters on 300 to 500 kc."

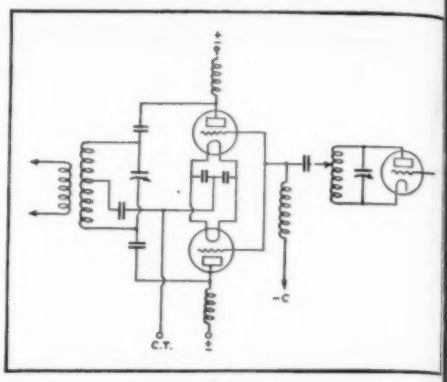


FIG. 9

Finding the Expeditions

(Help Contact These Stations, Report Their Signals to A.R.R.L. for *QST* Mention)

Station	*Frequency (kc.)*	*Call Signal*	*Remarks*
Schooner *Ramah*	5555, *8290*, *11,110*, 16,660. (Will keep special watch for amateurs in 7- or 14-mc. band for first ten minutes each hour in afternoon and evening.)	WCEN	Grenfell Northern Labrador Char ing Expedition. E. D. Brool W1TL, Operator. Scheduled to lea Neponset, Mass., about June 15 for three months' cruise to Labrad coast.
Yacht *Northern Light*	5555, *8330*, 13,240, 16,660. Schedules KUP at 10:30 p.m. and 3:15 a.m. P.S.T.	KGEG	Left San Francisco April 2 on two-year cruise around worl Bill Crabbe, W6ESW, Operato
Submarine *Nautilus*	5555, 6620, *8290*, 8450, 11,110, 13,240, 16,660. (Will CQ for amateurs nightly at 2100 or 9 p.m. E.S.T. on most suitable frequency designating band for answers; 6620 or 5555 kc. will be used for 3.5-mc. replies, 8450 or 11,110 kc. for 7-mc. replies, 16,660 kc. for 14-mc. replies, etc.)	WSEA	Wilkins-Ellsworth Transarcti Submarine Expedition. R. E. Me ers, ex-W3AJZ, Operator. Schedul KUP at 6:00 p.m. and 9:00 p.m P.S.T., WRH even hours, shifting t higher frequencies as day advance
Motor Car Station	*8000*, 8240. (500 watt) (FXC repeats FPCF-CQ for amateurs on 8 mc. at 2300 G.C.T. daily)	FPCF	Haardt Trans-Asia Expedition Personnel of 35 traveling in wilds Asia (Pamir region) for 18 month Now in Afghanistan.
'Plane *NC146M*	7- and 14-mc. amateur bands.	KHFQJ	Sikorsky Pan American Airway plane with expedition inland fro Sao Paulo, Brazil. May use PY ca in amateur bands.
S. S. *Morrissey*	6250, 8330, 12,300, 16,660.	VOQH	Bartlett-Nareron Expedition t Iceland and Greenland. Capt. Bo Bartlett in command, Paul Oe canyon, Operator.
Orinoco River	8790, 11,300, 14,400.	DDOE	1931 Dickey Orinoco River Ex pedition in Venezuela. W. J. Lan ex-2IV-2CYT, Operator.
Yacht *Mapelia*	6670.	DAIV	Count von Luckner on summe cruise. J. Pascal, W2CEV, Operato
Peru Observatory	....	OA4U	Carnegie Institute, Dept. o Terrestrial Magnetism station. S. L Seaton, W3BWL, Operator.

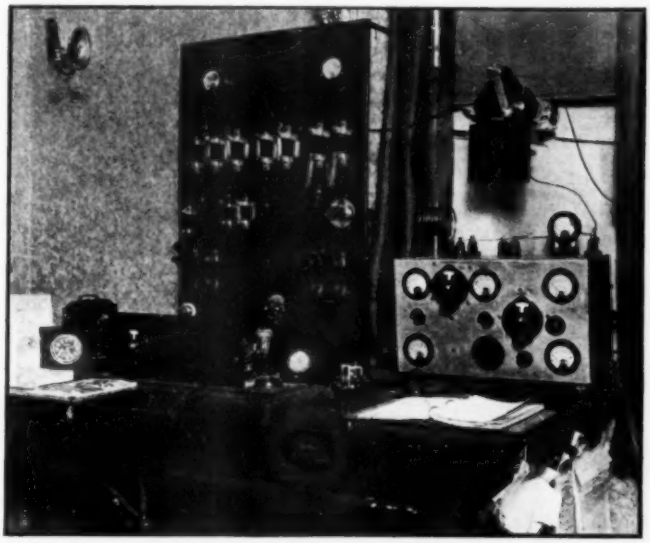
W3CXM, Alexandria, Va.

W3CXM is of unusual interest to amateurs, and particularly those amateurs participating in Army-Amateur activities, because the station is A-A Control Station for the entire country. The station is located about seven miles from Washington, D. C., and is the personal property of Capt. Norman L. Baldwin, Signal Corps. It was built by him and is installed in his home. "BN" is the only operator, repairman, etc.

The transmitter, a close-up of which is shown in one of the photographs, is semi-portable, being built to receive plug-in leads carrying plate supply, filament supply and "C" bias leads. It is built in an aluminum box 20 by 12 by 8 inches. The box has a removable back and is ventilated by holes drilled along the upper sides. A Type '10 crystal oscillator tube is used to excite a pair of VT-4-B (UV-211) tubes in parallel used as neutralized amplifiers. A 3950-kc. crystal is used, and the amplifiers work on the same frequency. A wiring diagram of the set is shown in Fig. 1.

The plate inductance for the amplifiers is mounted on top of the case to minimize absorption losses and to prevent the amplifier from reacting on the oscillator. The photograph of the transmitter alone shows an antenna coupling coil in place, but this coil is normally unused since the antenna is a single-wire feeder affair.

The keying system used at W3CXM is unusual in some respects. Ordinary blocked-grid keying forms the chief part of the system, the bias on the amplifiers being adjusted to completely cut off plate current when the key is open, and part of the bias being shorted out when the key is closed. However, it was found that this method alone allowed a noticeable back-wave to get through when the key was open, so a 10,000-ohm resistor was placed in series with the plate voltage lead to the oscillator tube so that the oscillator just about operates when the key is open. When the key is closed an auxiliary relay short circuits this resistor. This scheme has effected a satisfactory reduction of the back-wave.



W3CXM — THE BIG CHIEF OF THE A-A NET

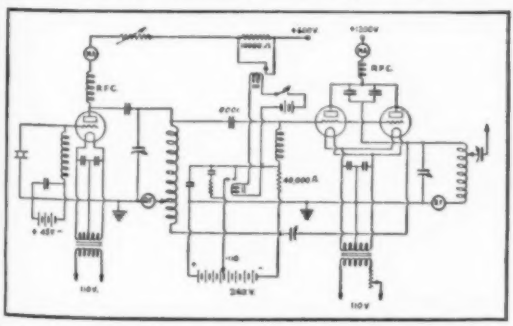


FIG. 1. — *WIRING DIAGRAM OF W3CXM'S TRANSMITTER*

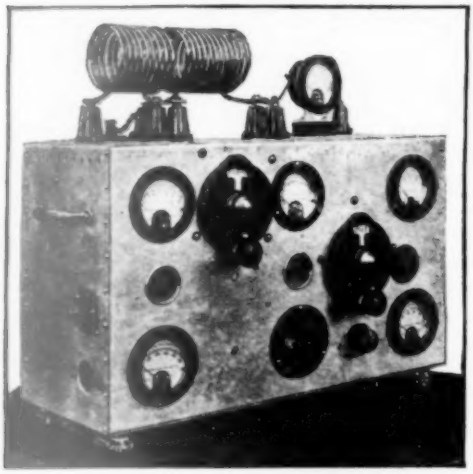
A Type '10 crystal oscillator feeds a pair of 50-watt tubes in parallel. A notable feature of this set is the keying system, which is explained in more detail in the text.

The plate supply for the set is furnished by a 1500-volt motor-generator, the output of which is filtered by a 15-henry choke and 8 μfd. of capacity. Keying relays, filament transformers, fuses, bias batteries, etc., are placed under the operating table with cabled leads plugging into each end of the transmitter proper.

The receiver shown in the station photograph has been replaced by a National SW-5 a.c. receiver. A seven-turn loop fifteen inches in diameter is used as the receiving antenna.

On Army-Amateur drill nights W3CXM acts as Army Net Control Station on the 3500-kc. band and works schedules with the corps area net control stations from coast to coast from 7.30 p.m. to 4.30 a.m. The station has been well up in the Brass Pounders' League every month since it was put into

operation and needs no introduction to Army Amateurs.



A CLOSE-UP OF THE TRANSMITTER

The set is completely shielded except for the amplifier tank coil and antenna coupling apparatus. The antenna coil is not used normally, however, because the antenna is a single-wire fed Hertz coupled to the plate coil through a small condenser.

Captain Baldwin has had a set on the air off and on since 1906. He operated 5YH in the old 200-meter spark days, and later signed NUSDKX and W2CXL. He expects to have W3CXM going regularly for the next three years.

The Hudson Division Convention

THE weather was fine, the committee was on the job and the attendance good, all of which was conducive to making the Sixth Annual Hudson Division Convention held at the Hotel Pennsylvania, New York City, May 8th and 9th, successful.

At 7:00 p.m., Friday, Dave Talley was in the small ballroom, with two assistants, surrounded by a crowd of delegates all anxious to register, and when some time later Director Walsh formally opened the convention with words of greetings every seat in the room was taken. The first speaker of the evening, after Director Walsh had given a very complete report of the annual meeting of the Board of Directors, was Mr. S. R. Riccobono, one of the engineers of the Pacent Electric Company, who talked interestingly on the latest development of his company on home-recording apparatus and demonstrated its operation.

A. A. Hebert, fieldman, spoke on legislative matters confronting the radio amateurs to-day, and also covered the communications department's activities. Mr. L. S. Fox, an old-time amateur, and now on the engineering staff of th National Carbon Co., lectured on the new E eready Air Cell, and present indications are th this cell should be useful in amateur stations f a number of purposes. To break up the evenin the star chairman of the contest committee, C. Sargeant, got busy, and before you knew it ever body had pieces of paper answering questions an drawing circuits, putting to use the intelligen most radio bugs are supposed to have; anyway it was after midnight before the meeting close and allowed some of the visitors to spend the re of the night at some "ham" shack.

Saturday afternoon found many new fac present and ready to listen to Ross A. Hul Associate Editor, *QST*, who gave a bully good tal on a pentode short-wave receiver and answere numerous questions — believe it or not, th "gang" knows how to ask questions. Afte listening and sitting down for more than an hou Sargeant again came to rescue of the restless an started that old-time stunt of "liars," and th poor judges had their hands full deciding wh were the two best liars. The most interesting tal of the convention from a technical standpoin was given by Mr. S. Young White, of Loftin White Laboratories, who covered very fully th early developments of sound recording from commercial standpoint, bringing these develop ments to date, demonstrating perfect reproduc tions as well. The meeting was thrown into a open forum so as to give every one a chance t ask more questions, ending a very pleasant an instructive afternoon.

As in the past, the Banquet is always the hi event of all Hudson Division conventions, an again Frank Frimmerman showed his gastro nomic knowledge by having a menu that prove most satisfactory to all the guests. The ente tainment features during the banquet were d the best and Ed. Berlin's Society Orchestr furnished good music for dancing. That goo entertainer, Eddie Green (W2AKM) and Co., d R-K-O Vaudeville, presented a good comed sketch. The principal speakers of the evenin were introduced by Toastmaster Walsh an consisted of Col. J. B. Allison, U. S. Army; C Peterson, Byrd's Antarctic Expedition; Dr. L. J Dunn, former director; George Droste, forme president, Second District Executive Radi Council, and A. A. Hebert, representing A.R.R.L.

Before general dancing started the distributio of prizes took place with Bronx Radio Club win ning first prize for the largest attendance; th liars' contest was won by W2ADX; the "kinks" by W2BWF; "technical answers" by W2BAM — "foolish answers" by W2ASS. The younges ham of the convention (12 years old), W3ARN and the only YL licensed op. present was W2WP After the numerous prizes were given a genera expression of appreciation was voiced to all th

(Continued on page 76)

THE COMMUNICATIONS • DEPARTMENT •

F. E. Handy, Communications Manager — E. L. Battey, Asst. Coms. Manager

F.R.C. Revokes Amateur Station License

ON April 11, 1931, agents of the Department of Justice, with U. S. Radio Inspector Dutrauil went to the home of Charles Andres, Jr., 2748 Gladiola St., New Orleans, La., and arrested Charles Andres, Jr., and seized the radio transmitter he was using as evidence. Mr. Andres, Jr., at the time held amateur radio station license W5NE which license was subsequently revoked on May 7, 1931, by the Federal Radio Commission as provided for in Section 14 of the Radio Act of 1927 and in accord with the Commission's practise and procedure adopted by General Order No. 95.

It was admitted by Andres that (1) he used an unauthorized call, (2) used frequencies not in the amateur band, (3) kept no log of his transmission.

Army Air Corps Maneuvers

WHEN the "Greatest Air Armada in History" visited the New England states on May 24th, 25th and 26th, Springfield, Mass., was chosen as the center of activities, since the airport at that city had the facilities to take care of the greatest number of planes (there were some six hundred in all). Several groups of the Armada were to be stationed at Hartford, Conn., and at various times some of the planes were to be down at Boston also. The necessity for some kind of communication between those three cities was immediately apparent. The Springfield Radio Association, Isaiah Creaser, W1BSJ, President, took the initiative and made extensive plans to do a "real communications job" for the Armada.

A complete amateur station was installed at Bowles Airport, Springfield, by members of the Association — this, in itself, was no small job. A staff of operators was chosen and the station was on the air constantly, from 6 a.m. until 6p.m. or later, on each of the three days of the New England maneuvers. The call at Springfield was W1BWY. Schedules were maintained with Hartford and Boston.

The Boston end was efficiently handled by W1AZN, W1CQN, W1ASF, W1CHR and W1AFY. Traffic for Springfield and Hartford from such points as Mitchell Field, L. I., Bolling Field, D. C., Roosevelt Field, etc., came through the Army Base station, WVO, at Boston, and was telephoned to the Boston amateurs for transmission to destination.

Hartford was covered by W1MK, with some coöperation by W1FE and W1BDI. W1MK kept hourly schedules with Springfield and Boston. W2AHF was also scheduled to assist in moving traffic to Mitchell Field.

When the Armada left New England it flew to Albany, N. Y. Radio communication between the New England cities and Albany was immediately opened up through W2BJA, who kept schedule with W1MK. Albany weather reports were sent from W2BJA hourly up to the time the planes took off for that city.

In addition to a large quantity of official and semi-official traffic, many personal messages were handled for members of the Armada. Several messages of importance bound for Washington, D. C., went through W1MK to W3BWT on regular schedule. A number of other amateurs not mentioned in this report gave incidental coöperation and were ready to assist in every way possible. To all who had a hand in the work — FB! And to the Springfield Radio Association members, who for the most part are responsible for the success of the affair: Congratulations!

What's Ahead

By Frank K. Tiffany*

In January *QST* (page IV) we invited contributions on every phase of amateur *communication* activity. New ideas and viewpoints, criticisms of and remedies for conditions, hints on DX, suggestions concerning radio club organization, information on interference elimination, exceptional two-way communication work covering emergencies, athletic games and trips, timely attention to operating practise, commentary on the place of radiotelephony, experimenting or development work in present-day amateur radio, data on low-power possibilities, 1750-kc. 28–56 mc. operation, etc., *all* are needed. There is plenty of romance and real accomplishment in amateur work. Read this contribution and the one presented last month. Then give us some real operating stories or the benefit of your views on different subjects.

In addition to publication of the best articles in *QST*, the author whose article appears to have greatest value of those received for consideration, has his choice of (1) a copy of *The Radio Amateur's Handbook* bound in leather cloth, (2) six pads of message blanks, or (3) six of the new type A.R.R.L. log books. Our offer is good throughout 1931. The article presented herewith is the prize-winning article for this month.

— *Communications Manager.*

THE pioneer in radio — that's what the amateur has been to date. But it's possible that he's going to have to change.

Don't be horrified at the suggestion. It doesn't mean that the pioneering type of amateur — trying out new circuits and probing into those mysterious higher frequencies with all their freak behavior characteristics and their refusal to do the expected — will be found in a few years at the Smithsonian museum in Washington, D. C., gathering dust, cobwebs and gaping crowds. His delvings mean too much to the science of radio.

But it does mean that now, more than ever before, it has become apparent that we must get something more solid under our feet, the majority of us, if we don't want the same treatment that the American Indian received when white men found they could make better use of the land upon which he hunted and played — the same consideration that a "squatter" receives when power engineers decide they'd like to turn water into his green and peaceful valley and use it to twist machinery and provide light and power for distant cities where bigger and better things (commercially) are being done.

Back of the amateurs on every wave they've used have lurked the commercials and the government services.

*Ens. C-V(S) U.S.N.R., Secretary, Kaw Valley Radio Club, Radio Editor, *Topeka (Kansas) State Journal*, W9DEB, 417 West Seventh St., Topeka, Kansas.

They've had money behind them, and public necessity. First it was the wave lengths above 200 meters they wanted — then they learned they could use the higher frequencies, and the amateur again was picked up, his suit was re-cut, and he was set down — with seams bursting and trousers binding, reminding him unpleasantly of the days when he had more room to play in. Such pains cause a good deal of mental activity — and it's a good thing they do.

To-day the Federal Radio Commission assures amateurs that it considers the operation of amateur stations to be "of public interest and necessity." By virtue of their non-commercial status, of their desire as citizens, to make use of radio, we have the right to occupy the bands we do.

But the commission also has made it clear to a number of broadcasting interests who chose to suggest otherwise, that it does not consider the use of a frequency by any station to give that station property rights on that wave. The same is true, it would seem, of any radio group, commercial or otherwise. Just how long our amateur status is going to make us safe on our present bands is a question to be treated with considerable respect.

How are we to get a more secure grip on our frequencies? Simple enough.

Broadcasting stations, as a class, aren't likely to lose any of the channels they now occupy. Because they are doing an undeniable service to the public, and because they have public opinion — votes — and pressure — influence — behind them, they're more apt to invade regions of the ether they've not yet used.

The commercials won't lose, either. They have traffic, important traffic, vital to business, which must be handled. And government services, ever-increasing in scope and in frequency requirements, probably will be the first served.

That leaves the amateur. If he continues *predominantly* to be of the "play-boy" type — dawdles with the tuning controls at all hours of the day and night, spends his time entirely in seeking DX, splatters the ether with careless notes, wanders aimlessly as of yore — his play house is going to fall on him: If he doesn't have time to handle traffic, to experiment and aid in finding the things which make radio grow, in learning something which will be of definite, concrete assistance to himself and the nation in time of need, then he won't continue to be "of public interest and necessity."

Get into the experimenting game, fellows. Handle traffic. Sign up with the Army Amateur Net. Enlist in the U.S.N.R. Help those nets to function so the amateur bands will be useful for training purposes for the Army and Navy (in addition to carrying their normal load of amateur communication) — *so* valuable that those federal services won't *let* the commercials and the broadcasting stations gobble them up. Interest yourself in worthwhile expedition work in addition to full participation in these other unselfish activities we have mentioned.

It won't take a lot of your time. Both the Army Net and the Volunteer Communications Reserve offer worthwhile experience in radio operating procedure and in radio discipline. The A.A. operator and the U.S.N.R. radioman accomplish more things per minute on the air than any other short-wave artist except the ORS? commercial or service man. You learn how to get things done systematically, that's all.

There'll be plenty of time to do the things you did before. You'll work just as many foreigners as you did, and get just as many precious QSL's — or fail to get them, as the case may be. But you'll be devoting one night a week to a serious and concentrated effort to make retention of the amateur bands, worked by amateur stations, a matter of public concern.

Radio pioneering will go on. The Experimenters' Section will suggest more than ever the solutions you need so much. The ultra-short waves will be probed and opened wide.

Only the drifter will suffer. He'll be pinched out by more strict licensing requirements. He'll be dropped into the wilderness of higher frequencies that as yet have no workable, commercial value — to flounder about as before, having a peach of a time, maybe, but squawking at the inconvenience of having continually to shorten his sky-wire and decrease the turns in his tank coil.

Traffic Briefs

The Milwaukee Radio Amateurs' Club will hold its annual basket picnic on August 2nd at Moose Lake, Nashotah, Wis. This will be the fifth annual picnic of hams from Milwaukee and the surrounding country. It is an "all-family" affair and any hams who happen to be in that part of the country on August 2nd are cordially invited to attend.

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A summer contest for Nebraska amateur radio operators has been announced by the Cornhusker Amateur Radio Association of Lincoln. Any Nebraska amateur, whether a member of the association or not, is eligible. The competition will last from July 15th to September 15th. The aim is to boost activity throughout Nebraska. Scoring will be as follows: Completeness of log, 10 points; traffic count (A.R.R.L. practise), 35 points; number of Nebraska stations worked, 20 points; number of Nebraska schedules kept, 20 points; quality of signal, 15 points. The contest is open to both 'phone and c.w. stations. Any one interested should notify Bill Bamer, Secretary of the Cornhusker Amateur Radio Association, Y.M.C.A., Lincoln, Nebraska.

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W4PBO worked FX, an oil expedition on the Orinoco River, South America, on May 14th, and took a bunch of traffic from them. Several other amateurs are reporting contacts with this station. Further details would be appreciated.

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MORE RE: 3500-kc. DX

More and more reports are being received on 3500-kc. DX. That band is surely coming into its own. A report from W5AL says, "Worked K6DV on 3.5 mc., 5:00 to 6:00 a.m., C.S.T., on March 8th, using two type '01A's with 450 volts on plates." W7AAT also worked K6DV, with reports of QSA3 R5 at both ends. W7IF, W7ALO, W7UN and others have worked New Zealand on 3500. W8DLG heard ZL2BE at 0145 E.S.T., March 1st. W2DV has been getting his share of the 3.5 mc. DX — on January 3rd he worked G6WY and on January 29th he snagged PA0QQ. W8DSP reports contact with F8SM at 9:20 p.m., E.S.T., March 29th, both stations operating on about 3610 kc. Watch that 3.5-mc. band, fellows!

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The first message known to have been handled from Porto Rico on 28 mc. was received from K4BPF by W2JN. W2JN reports hearing K4BPF's c.c. signals very consistently on 28 mc. between 1600 and 2000 GMT, the strength sometimes being R9. K4BPF hears a number of 28-mc. signals from the states, mentioning W9BYC and W5QL in particular.

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W6ACV reports a QSO with KGEG, the schooner *Northern Light*, which left San Francisco on April 2nd bound for the South Sea Islands and Australia. Bill Crabbe, W6ESW, is operator on KGEG and will be glad to work amateurs whenever possible. Watch for KGEG on 8330 kc. Other authorized frequencies are 5555, 13240 and 16660 kc. but the first-mentioned (8330) is used mostly.

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A course in code instruction by radio is being broadcast from station WRVA, Richmond, Va. The first lesson went on the air on February 7th. The first complete word in this lesson is "CAB" and W3CAB was present in the studio at the time of the broadcast! These code lessons are put on by W3AAJ and W3ZU. Newcomers might find the broadcasts helpful.

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W6AXM, Sacramento, Calif., maintains daily schedules with KA1NF and AC8HM, and advises that any messages mailed to him from anywhere in the United States will be sent direct to the Orient on the day received.

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Say, feller, if you haven't got a call of your own, "lay off that other guy's designation!" Too many complaints are being received of the illegal use of calls. Let's call a halt!

On May 9th the Danville Military Institute Radio Club sponsored a real old-fashioned "hamfest" at Danville, Va. It was called a "North Carolina-Virginia hamfest," but there were visitors from outside those states. Even though the weather was adverse and a hard rain prevailed the attendance was 42. The program included a trip to the studios and operating plant of WBTM, technical sessions, a banquet and entertainment, contests and a general "bull" period. Among the speakers at the banquet was Director Gravely of the Roanoke Division. All in all, it was everything a hamfest ought to be. Credit for the success of the "fest" goes to John M. Boland of W3HY for his initiative and effort in arranging the program. The D.M.I. Club hopes to sponsor a similar "young convention" every year.

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ATTENTION! Attention is called to "Finding the Expeditions" which appears elsewhere in *QST*. Please note the times stated for special watches for amateurs kept by WCEN, the nightly stand-by schedule for WSEA's "CQ amateurs" at 9 p.m. E.S.T., etc. Give us reports on all these expeditions via QSL-card, please, whenever you hear them — the cards will be preserved for the operators on return. Also, you will find intense interest in following and working expeditions and assisting in the necessary personal and official traffic work whenever possible.

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The Communications Department is considering plans for the award of a special A.R.R.L. "EXPEDITION CONTACT STATION" and "EXPEDITION REPORTING STATION" certificate to regularly credit worthwhile work falling in these two classifications, with records of all certificates issued kept at Headquarters and mentioned currently in *QST* as issued. Comment and ideas further along these lines will be welcomed — records of reports on expeditions — two-way work with expeditions, etc., are being started from June 1, 1931, and further announcement will be made as soon as the study of all available information together with your comment and reports can be completed.

— *F. E. H.*

Official Broadcasting Stations

(CHANGES AND ADDITIONS)
(Local Standard Time)

W5AUW (3700 kc.) Mon., Wed., Fri., 8:00 p.m.
(7100 kc.) Daily, 12:30 p.m.
W6AEO (7189 kc.) Tues. and Thurs., 6:30 p.m.
W6CRF (3507 kc.) ('phone) (cc.) Mon., Thurs., 8:00 p.m.
W6DJZ (3511 kc. used) ('phone) (cc.) Tues., Fri., Sun., 8:00 p.m.
(3517 and 3522 kc. available)
W8CRA (14030 kc.) Wed., Sat., 6:00 p.m.
W9FFY (3675 kc.) Mon., Wed., Sat., 8:30 p.m.

Traffic Summaries

(APRIL–MAY)

Pacific led by Sacramento Valley	14109
Central led by Michigan	13834
Atlantic led by Western New York	8366
New England led by Connecticut	4579
Midwest led by Iowa	2091
Dakota led by Southern Minnesota	1954
Delta led by Arkansas	1802
Hudson led by New York City and Long Island	1798
West Gulf led by Southern Texas	1516
Roanoke led by Virginia	1310
Southeastern led by Georgia-South Carolina-Cuba-Isle of Pines-Porto Rico-Virgin Islands	1087
Quebec	581
Ontario	573
Northwestern led by Montana	555
Rocky Mountain led by Colorado	377
Vanalta led by British Columbia	61
Maritime	30
Prairie led by Saskatchewan	17

939 stations originated 13,441; delivered 11,492; relayed 29,707; total 54,640 (85.5% del.)

Although Ohio worked hard and ran up a total of 3932, MICHIGAN went her one better and came out on top this month with 3951. With the coming of the summer months, amateur radio's old bugbear, the really interested Sections will have a chance to come to the front and "cop the Banner." In some Sections plans are already under way to take advantage of the others' dormancy. How about *your* Section? Study the above Summary and see which way the wind blows.

BRASS POUNDERS' LEAGUE

Call	*Orig.*	*Del.*	*Rel.*	*Total*
W6AXM	650	850	310	1810
W3CXL	63	159	983	1205
W9DZM	512	611	72	1195
W8DDS	204	197	418	819
W6EGH	47	450	294	791
W6ASH	18	27	720	765
W3SM	322	67	295	684
W8MH	39	23	520	582
W9FFY	31	30	520	581
W6YG	183	73	308	564
W9GFL	127	112	316	555
W6AOA	160	26	358	544
KA1HR	165	143	235	543
W7AWH	14	39	490	553
W8PP	97	51	383	531
W6QT	175	100	225	500
W9DGS	23	32	420	475
W6HM	185	282	7	474
W9FAW	3	16	448	467
W9BGW	31	60	374	465
W1AFB	2	16	430	448
W8BMG	12	47	383	442
W1MK	99	102	237	438
W6CPF	84	10	340	434
W9YB	337	54	39	430
W5BMI	108	105	207	420
W8CKI	66	53	299	418
W3CXM	37	71	306	414
KA1SL	98	60	246	404
K6DV	352	26	20	398
W8DLG	23	23	342	388
W3BWT	98	94	189	381
W8DYH	25	44	301	370
W8DMR	25	29	312	366
VE3GT	75	56	204	335
W8DES	58	22	242	322
W5ABI	94	107	114	315
W5AUC	276	17	22	315
K6FCX	58	11	244	313
W8BSE	26	56	228	310
W3MC	41	89	174	304
OM1TB	223	75	—	298
W9NP	29	176	90	295
W5AMC	17	21	256	294
W1YU	92	67	128	287
W6EFC	18	27	240	285
W8BJ	32	43	196	271
W9IO	104	30	128	262
W3NF	50	37	172	259
W8DFR	92	26	140	258
W9ALR	67	3	186	256
W9HK	29	11	206	246
W8DSS	21	12	202	235
W8RN	34	11	182	227
W9BRA	34	22	170	226
W2AIQ	91	33	101	225
W8BJO	56	31	138	225
W8YA	56	44	124	224
W2LU	29	27	168	224
W5YW	60	27	137	224
W5IQ	89	102	32	223
W6EGK	63	54	104	221
W8CFI	64	53	98	215
W8AM	20	25	170	215
W6ALW	3	11	197	211
W8BYD	127	41	41	209
W8DED	125	10	72	207
W6ALX	27	126	52	205
W8GZ	7	16	182	205
W9BWJ	47	28	128	203
W1CJD	22	12	169	203
W3MG	27	8	166	201
W6EKC	60	57	82	199
W6AMM	56	126	2	184
W6AJP	—	50	132	182
W8CZP	46	55	76	177
W1NS	39	54	78	171
W1ATO	21	53	94	168
W5AUL	17	107	36	160
K6COG	56	55	34	145
W6DER	9	77	48	134
W6ZS	51	75	8	134
W7ZD	16	102	14	132
W9CVQ	14	51	62	127
W7ED	22	69	12	115
W6DFR	12	55	30	97
W1UE	14	51	26	91
W1GV	31	54	4	89
W1BGW	1	56	26	83
W4GT	3	67	12	82
W6DAK	12	54	15	81
W5HY	15	52	10	77
W1ASF	20	50	4	74
W2JF	11	50	5	66
W4ACM	5	52	6	63

Special credit should be given to the following stations in the order listed responsible for *over one hundred deliveries* in the message month: W6AXM, W9DZM, W6EGH, W6HM, W8DDS, W3CXL, KA1HR, W6ALX, W6AMM, W9GFL, W5ABI, W5AUL, W5BMI, W1MK, W5IQ, W6QT.

DIVISIONAL REPORTS

ATLANTIC DIVISION

SOUTHERN NEW JERSEY — SCM, Robert Adams, 3rd, W3SM — M. E. Gregory, W3JL, our new Route Manager, kept a schedule with Manila. W3BBD is a new Official Observer. W3NK is installing crystal. W3VX was QRL on South Jersey Radio Club's hamfest. The Atlantic Radio Club in Atlantic City has forty members. W3ACX reports good work on 'phone and CW. W3ATL and W3ARN are active. W3BIN is located in the shadow of the Absecon Light House. W3BUF is on 'phone. W3BGT has two 50-watters in push-pull. W3ANK has a dining car for his shack. W3LT has antenna trouble. W3APV bought a 50-watter. W3ARV is on 7 mc. W3AIV is a receiver expert. W3TH uses a sideswiper. W3UT is active in the Atlantic Radio Club. The Morris County Radio Club is having excellent meetings. W3SM had nice total due to Naval Reserve traffic. W3ASG lost his mother. Our sympathy, Doc. W3BEI is logging many amateurs off-frequency. W3AWV reports nice total. W3BCC kept Salem County on the air. W3AQJ gets out with a type '24. W3ANT has a fine signal. W3ATC reports his new TNT is FB. W3ADC is QRL at DuPonts. Keep up the fine showing of activity, fellows.

Traffic: W3BAQ 2, W3VX 2, W3BCC 4, W3ATC 17, W3JL 74, W3QL 170, W3BBD 33, W3NK 46, W3ASG 42, W3AWV 64, W3ANT 6, W3BEI 53, W3BGF 47, W3ATA 7, W3ATL 5, W3ACX 7, W3BGT 4, W3ARP 4, W3ARW 6, W3BDO 12, W3ARN 10, W3UT 6, W3LT 5, W3AIU 4, W3AUI 3, W3ATU 14, W3BLR 4, W3SM 684.

MARYLAND-DELAWARE-DISTRICT OF COLUMBIA — SCM, Forrest Calhoun, W3BBW — W3CXL continues to hold the traffic lead for our Section. Maryland: W3NY handled a bunch of traffic. W3AFF is now doing AARS work. W3BGV is about ready to go with a 50-watter. W3ZK built a new AC receiver. W3PU is trying 1900-kc. 'phone. W3BBW is changing things around some. W3ED is busy with exams. Delaware: W3HC is still holding his own in traffic. W3AJH says DX is plentiful. District of Columbia: W3BWT has his usual high total. W3BAT is going to move. W3BWL is leaving, June 6, for Peru, to set up the Magnetic Observatory station OA4U. Listen for him, fellows. W3CAB hasn't had much time for traffic. W3CDQ is changing her location. W3AKR wants his ORS suspended for the summer.

Traffic: W3CXL 1205, W3BWT 381, W3NY 43, W3BAT 40, W3AFF 26, W3ZK 23, W3HC 16, W3PU 12, W3BWL 6, W3BBW 6, W3AJH 4, W3CAB 2.

WESTERN PENNSYLVANIA — SCM, R. M. Lloyd, W8CFR — W8DLG maintains his place as high man. W8YA is making up for lost time. W8CMP reports his Duesy was hit by a truck while returning from the Directors' meeting. W8CUG is worried about his mast; four of its guys have broken during recent wind storms. W8AGO is remodelling his station. W8APQ operation is having competition from the piano. W8CEO says there will be no change in his set this season. W8AVY has a new 14-mc. transmitter. W8DGW is house-cleaning! W8ARC is chasing DX. W8AJE has QRM from BCL's; a telephone line running from a BCL receiver to another BCL's house modulates AJE's receiver! W8GU is planning a new transmitter on 4 mc., accurate within one cycle! W8BSE has applied for an ORS certificate. W8CRA is building a new shack. W8CKO, an old-timer, reports. W8PA is planning a new 7-mc. job. W8AYH blew his filter! W8ASE has another new MOPA. W8CPE is increasing his power. W8CFR has a new oscillator-doubler panel and a new PA under construction. A '52 is being installed at W8DUT.

Traffic: W8DLG 388, W8YA 224, W8CMP 76, W8CUG 69, W8AGO 19, W8APQ 18, W8CEO 12, W8AVY 7, W8DGW 5, W8CFR 2, W8BSE 310, W8CRA 64, W8CKO 32, W8PA 8, W8AYH 2, W8DUT 25.

WESTERN NEW YORK — SCM, John R. Blum, W8CKC — W8BJO turns in fine total. W8DBX had license trouble. W8CKI is new ORS. W8CIL has new receiver. W8DME reports U.S.N.R. going strong. W8AJ is chief instructor. The STTA is also going strong out W8BHK's way. W8BLH is strong for beam transmission. W8BJI is using an MOPA. W8IH ran up big total on 3500 'phone. W8DSS reports W8CPJ is new member in Oneida. W8DSP is busy. W8ERP, W8EFO and W8ERU are new hams in Rochester. W8CEZ and W8ACY are on 'phone. W8AGU gets out well. W8SU is going on 'phone. W8DFN is using a collapsible antenna. W8BOX is the only "old-timer" on air in Rochester. W1KR was in our district this month. W8BYO has his Army gang going full blast. How about a contest between Army and Navy gangs for traffic totals? W8DES has a real total. W8DCX sure gets the DX on 7000. W8ACQ is on 3.5 again. Our most successful 14-mc 'phone is W8AFM. W8CSW is going strong on 1750 kc. W8QB is QRL in the OW's garden. W8DJA is returning to W1ASV for the summer. A new convert to crystal control — W8BIF. W8AUU plays checkers with W8EKM every evening. W8DME is doing some BCL work in Auburn State Prison. Six new ones in Syracuse: W8EGY, W8CWH, W8PU, W8AQE, W8EEL. W8BYD knows how to keep Jamestown working. W8BIF is QRL — the YLs. The J.A.R.A. had a big hamfest this month — a regular young convention.

Traffic: W8BJO 225, W8DII 20, W8CKI 418, W8AYM 47, W8DME 50, W8BHK 88, W8BLA 1, W8DHO 8, W8IA 189, W8DSS 235, W8DSP 4, W8BYO 43, W8BFG 16, W8DES 322, W8DCY 16, W8AFM 10, W8CSW 16, W8QB 5, W8DIA 16, W8BIF 19, W8CZP 177, W8AUU 15, W8DHQ 43, W8AYU 5, W8BYD 209, W8ON 2, W8ACK 2, W8BWY 104, W8BCN 14, W8DMJ 14.

EASTERN PENNSYLVANIA — SCM, Don Lusk, W3ZF — W8AIT complains of stations refusing to handle traffic. W8VD says spring fever has him. W3NF will be on all summer. W3UX reports that W3DR is working on the J. N. Pew (KDTP). W3LZ has a new commercial ticket. W3OK has a bunch of FB schedules. W3MC will be QTAing schedules soon for summer. W3MG has learned to neutralize MOPA properly. W8CFI will be off during June. W8CVG will come on in July. W8DHT is complaining of QRN. W8EU says "raising a family and traffic total is a hard job ART." W3AKB is banging out traffic. W3AAD is due for his ORS. W3ADE shot his 50-watter. W3AQN wants to be an OO. W3WG is on 14 mc. W3DZ reports for W3AJS and W3AFB. W3GS is working hard in Phila. W3ZF is on week-ends only. W3BET and W3AOJ report. W3EV is going to put up new antennas. W3BBK sends in his first traffic report. W3OP tried his hand at 14 mc. The Lansdowne Radio Assn. has a membership of 82. Club rooms are at 16 N. Wycombe Ave. Officers are W3ACF, Pres.; W3BG, Vice-Pres.; W3BQP, Treas.; R. Simons, Corr. Secy.; H. Keebler, Rec. Secy. The Association publishes a monthly paper, *Static*.

Traffic: W3WG 2, W8EU 5, W3ADE 19, W8VD 15, W8AIT 29, W3AQN 29, W8DHT 38, W3UX 40, W3OK 76, W3AKB 101, W3AAD 146, W3MG 201, W8CFI 215, W3NF 259, W3MC 304, W3OP 11, W3BET 56, W3BBK 58, W3EV 40, W3AOJ 27.

CENTRAL DIVISION

KENTUCKY — SCM, J. B. Wathen, III, W9BAZ — The Kentucky Derby, the yearly turf classic, has been run. Our own race for Watkin's 852 Trophy will finish with the June reports. W9ALR makes a final push and lands in the BPL. W9BWJ has been appointed RM for Eastern Kentucky; W9AZY, Western. W9OX is acting A.A. NCS for remainder of drills. W9QT is taking rest per doctor's orders. W9AQV complains of QRN. W9BAZ has new outfit perking. W9AUH has an irregular schedule with W8EA. No news from W9EDQ. W9LH doesn't like radio in hot weather. W9AZY has joined Nat. Guard. Summer slump is starting at W9BEW. W9ACS was appointed Unit Commander in U.S.N.R. W9ERH is acting NCS for Nat. Guard units. Watching the "ponies" keeps traffic low at W9ARU. W9EYW averages a message per each hour's operation. W9CDA raised his antenna and increased results. W9CZW has a crystal 'phone now. W9DDQ reports conditions bad on 7 and 14 mc. Now that his license is back, W9BAN is having trouble with his transmitter. W9CEE shifted to 14 mc. W9CML gives us a nice report. W9GGB is going visiting in Virginia. Get some traffic, W9FZV. W9ETD applies for

the 'phone OBS appointment. W9FQQ is back from Purdue. Ex9AHM, now at WFIW, will open up in Hopkinsville with a nice outfit. W9BNE wants to know how sick he has to get before W9BAZ will send him some Old Grand Dad. Reports are not restricted to ORS; every one is welcome.

Traffic: W9ALR 256, W9BWJ 203, W9OX 137, W9QT 60, W9AQV 60, W9CNE 50, W9BAZ 44, W9AUH 36, W9EDQ 33, W9LH 33, W9AZY 21, W9BEW 21, W9ACS 16, W9ERH 14, W9ARU 13, W9EYW 12, W9CDA 10, W9CWZ 10, W9DDQ 8, W9BAN 7, W9CEE 4, W9CML 4, W9GGB 1.

INDIANA — SCM, George G. Graue, W9BKJ — In order to stimulate activity in traffic the SCM will give a crystal to the station having the highest totals for the months of July and August. Every Indiana station is eligible to take part in the traffic contest mentioned in last month's report. W9YB and W9CVQ make the BPL. W9ESU QSYd to 7 mc. W9GYW is new station in Mitchell. W9FFT is waiting for filter condensers. W9GJS is moaning the loss of schedules. W9CKG has a new MOPA. W9AET shows signs of activity. W9AKJ changed both transmitters to TNT. W9UM contacts HC1FG on schedule. W9ABW has applied for ORS. W9DAF and W9DUQ are active. W9AIP is rebuilding again. W9EOC wants to contact more Ind. stations. W9AEB is planning new crystal job. W9GGJ is changing to MOPA. W9IQ and W9IU are heard occasionally. W9GZB is a new ham at Evansville. W9HDB and W9HEN are new stations in Valparaiso. W9EGE is building a constant temp. over. W9BWI put up a 70-foot tower. W9AIN will be listed as an ORS again when station is put together. W9DBJ was completely wrecked by lightning. W9ETH is rebuilding. W9AZC is the latest addition to the 'phone kingdom in Ft. Wayne. The Indianapolis Radio Club is sponsoring week end outings. The Ft. Wayne Radio Club station is still under construction.

Traffic: W9YB 430, W9ESU 196, W9GJS 176, W9CKG 132, W9CVQ 127, W9AET 66, W9BKJ 54, W9ASJ 18, W9GJG 17, W9DHJ 15, W9ABW 14, W9AKJ 14, W9UM 11, W9AXH 8, W9EOC 8, W9AIP 6, W9AEB 3, W9GGJ 3, W9FYB 2, W9CHA 2, W9YV 10.

WISCONSIN — SCM, C. N. Crapo, W9VD — W9GFL cancelled all schedules until fall. W9FAW is part of a transcontinental chain, W7AWH, W9DGS, W9FFY, W9FAW, W8BMG, W8BJ and East. W9DKH was home for a few days. W9BIB sends in his highest total in years. W9FSS will be off the air all summer. W9CFT is at his new location. W9EIK wants schedules south. W9OT is building an A.C. receiver for W9CID. W9EHD has been appointed Official Observer. W9VD is putting in a new plate supply for the crystal oscillator.

Traffic: W9GFL 555, W9FAW 467, W9DKH 87, W9BIB 74, W9FSS 62, W9CFT 29, W9EIK 16, W9OT 5, W9EHD 5, W9VD 14.

ILLINOIS — SCM, F. J. Hinds, W9APY — The honors for being high man again go to W9DZM. W9FCW has been dressing up the transmitter. Bad power leaks at W9DBE. W9EMN is building an MOPA. W9FI heard J1CT sending test signals. W9GFU is finishing new dynatron. W9AFN will try his 14-mc. 'phone again soon. W9CKZ has signed up with A.A.R.S. W9ACU handles much 'phone traffic with Mrs. W9ACU as the chief op. W9BLI is looking for foreign schedules. W9EUU has been having fine QSOs with IPH. W9CGC worked K9P and KN2, ships off the coasts of Africa and Azores. W9CUH has the new crystal set working. W9DKF has a telefoto outfit. A new '10 is working at W9DKF. W9DSS has a new MOPA. W9FRA is out for more traffic. W9FKC has a crystal outfit. W9QI is building a commercial type layout. W9PK has gone DX crazy. W9CUX has a new DeForest tube. W9BIR and W9AMO are shoving the messages in great shape. W9DZG won the QSO contest in the E. St. Louis Ham Clubs. W9GUF is a new station in E. St. Louis. W9AND is QSO both coasts on 3.5 mc. W9GFY was QSO California using '71A and 45 volts on 14 mc. W9GIV says all of the Oak Park hams are on the air. W9BSR is using a new 7-mc. Zepp. W9FXE has a new TNT. W9BNR is tuning up for 14 mc. W9LL has been ill. W9CZL has a new Hertz. The TNT is working fine at W9KB. W9AVB is experimenting with one of the 1930 National Air Race transmitters. W9JO worked K6AJA and X1D. W9GWB also worked IPH. W9DIL, W9GWB and W9CNG are all on 7000. W9OJ's new antenna posts are the latest thing out — being 60 feet high and only weighing 57 pounds. W9DDE says "Watch my Traffic Smoke." W9GKI is building a push-pull receiver. W9GVU gets out fine with two '45s. W9GXQ and W9GWL are new stations in Rockford. W9GWL used to be W9BFQ. W9ERU has added 32 feet to the masts on the house. W9EUU is now using '10s. W9GYO is a new station. Transmitter and receiver QRM at W9GAI has caused a lot of worry lately. The Federal Radio Commission has gladdened another heart with the call of W9GZR in Chicago. W9CNY calls to his friends on the street a few blocks away using a portable public address system. Hi. W9GV got a card from AU1AI in Siberia reporting him QSA5R8. W9CTP is building up an MOPA 'phone. W9GPJ is a new ham in Chicago. W9AFN has a new 50-watt 'phone. W9BYL is building a new power supply. W9CYT is moving. W9FAU is a new traffic man. W9EAL has a new Dec. QST tube AC receiver. W9ALA is doing nicely on 3500. W9ATS will soon be an ORS.

Traffic: W9DZM 1195, W9ALA 152, W9ERU 126, W9GV 79, W9AMO 50, W9BLI 45, W9CUX 42, W9AFN 37, W9DZG 37, W9EUU 33, W9ACE 29, W9FKC 29, W9ATS 26, W9ENH 25, W9QI 23, W9CZL 22, W9FRA 22, W9BIR 20, W9BNR 20, W9LL 19, W9BYL 17, W9ACU 16, W9FCW 14, W9CKZ 13, W9APY 12, W9DBE 12, W9FAU 12, W9FXE 12, W9CGC 11, W9CYT 11, W9FI 11, W9GFU 10, W9GYO 10, W9DKF 9, W9ET 9, W9KB 8, W9CNY 7, W9AVB 6, W9DSS 6, W9PK 6, W9CUH 5, W9BSR 4, W9GAI 4, W9ECR 3, W9EMN 2, W9BVP 1, W9GIV 1.

MICHIGAN — SCM, Ralph J. Stephenson, W8DMS — Another big hamfest for Michigan, this time at Grand Rapids. About 85 attended, including W9BKJ, the Indiana SCM. Congratulations, fellows, on a very successful party. W8DED is resigning as Western Michigan RM. Sorry to see "Russ" QRT. W8BMG will be able to keep the gang over there busy. W8BKT, W9GJX, W8CWK and W8BG all report good DX. At last, W8DYH was beaten out of first place in traffic totals, W8PP taking the honors with W8BMG running a close second. W8MV takes good care of the A.R.R.L. net for American Legion here. W8BXJ is moving into Detroit for the summer. W8DXY has changed QRA to a farm near Pontiac. W8DJQ is leaving for New York. W9HK dropped us another of his newsy letters. W9CE is building bird houses in his spare time. W9CSI getting out FB. W9FPF and W9BEC are QRL with school work. W9GXE is a newcomer among the Michigan nines. W9DYH, W9BBP and W9HK were visitors at W9GJX's. W8DMR tickled his crystal into producing a good report. W8WO has been experimenting with 14-mc. 'phone. W8DFE ops slowed up on account school work. W8AM hits the BPL. W8DDO is neglecting his hamming for music and tennis. W8BRS is headed for the lakes for the summer. W9AXE attended the Duluth hamfest. W8AJC is keeping plenty busy "down on the farm." W8FX has explained the crutches and the steel-jacketed bullet in his leg exactly 73 times. W8SH says his double Zepp on 7.5 mc. is very directional. W8DAQ comes up smilingly. W8DZ reports working a foreigner (in Hamtramck). W8PP and W8FX get new ORS certificates. W8JX took a three weeks' vacation.

Traffic: W9PP 531, W8BMG 442, W8DYH 370, W8DMR 366, W8DED 207, W8BJ 271, W9HK 246, W8AM 215, W8CLL 172, W9GJX 112, W8SB 86, W8BMZ 80, W8GKR 60, W8AKN 60, W8CFZ 59, W8DFE 59, W8DAQ 58, W8FX 52, W8GP 42, W8VL 42, W9AXE 39, W8DXY 35, W9CSI 32, W8BXJ 30, W8CST 28, W8AJC 28, W9GXE 27, W8BG 20, W8CWK 18, W8DFS 15, W8DZ 15, W8WG 14, W8MV 14, W8BTK 12, W8ENC 11, W8AUT 10, W8BPL 9, W8ACW 7, W9EGF 7, W8CKZ 6, W8SH 5, W8DDO 5, W8JX 5, W8WR 3, W8BRS 2, W8BV 5, W8DVQ 2, W8NR 8.

OHIO — SCM, Harry A. Tummonds, W8BAH — Three banners in a row for OHIO! This month our total is 3932, and that ought to keep us up in the running. W8DDS leads the state this month. W8MH is a close second. Here's the BPL members: W8DDS, W8MH, W8RN, W8GZ, and W8DFR. W8HH has rebuilt. W8DZH has some good schedules. W8TK, W8MH, W8LI, W8BZL, W8FA, W8UW,

W8OQ, W8BCF, W8DMX, W8CHD, W8EBT, W8KP send in good reports. W8BBH is on 3780 kc. W8CUL is organizing 'phones for traffic work. W8CUR is housecleaning. "Sure handled lots of traffic this month," reports W8BAC. W8CX must carry on. W8AXV will be on soon with 250 watts. Some good portable work is being done by W8CSS. The SCM was glad to meet the following ORS when in Cleveland last month: W8AND, W8JJ and W8OQ. Congratulate our new ORS, W8ARW. W8ATV burnt his hands with acid. W8CGS has regular schedule with SCM. W8DCJ writes a letter. W8US is off air for summer cruises. "Popped '66," says W8DBK, "but will have W8MK club station report next month." W8BMX delivered message for Hawaiian party in Cleveland. W8GZ continues his good traffic work. "YL and studies," says W8CIY. W8EEW is a new ORS in Lakewood. The reports from W8BNC are better every month. W8BTT has a 14-me. set going. W8EEQ handled some traffic for Western Union. Look out for that new '52 at W8CKX. W8AND is net control, U.S.N.R., at Toledo. Look for W8CCK at Camp Perry for two weeks starting July 5. W8BSR has a new '52. W8DU has been on vacation at W8DZG and W8DJG. W8BKM is now on 3750. W8RN never misses on his report. "Hurray, we got our corn planted," says W8CK. W8BAH is pulling for four Banners in a row. W8VP reports a new club, Cambridge Amateur Radio Operators. W8JR is a new ORS in Napoleon. W8EFG and W8DDV are new reporters. W8DUD will be off air for awhile. Nothing new, but a lot of QRN reports W8ADS. W8SG has new push-pull job. W8BDU sold his outfit. W8CMB says, "YLs fine here but cash low." W8CSB forwards dope on G5UM. W8DFR made a fine total for the BPL. W8DIH won the Norwalk Amateur Radio Association QSO contest. W8EB reports a fine total. W8UC reports Hams Limited now 100% crystal-controlled. W8DKG, a new reporter, says W8EPW and W8EDE new Cleveland hams. W8EGZ is a new reporter from Medina. W8CFT will be an ORS by next report. W8APT reports his type '10 looks like a '66 when he steps on the key. W8AZU has remote control. W8DVE is a new reporter from Akron. W8AQX is doing some real work. W8CHD reports a new club in Chillicothe called the "Mount Logan Gang," with W8BPH, W8ADL, W8CHD and W8CUO. "The Moundbuilders Club is going fine," reports W8ALG. W8BBD has appendicitis. W8ETM just got his Ham ticket. Here's another club at Toledo called the Maumee Valley Radio Association; reported by W8ESN. W8DVL has applied for ORS. W8BZB is moving. W8CWA has no schedules at present. W8CRH reports that W8CMK is confined to his bed with bone infection of his ankle. A word from his ham friends would cheer him up.

Traffic: W8DDS 819, W8MH 582, W8DFR 258, W8RN 227, W8GZ 205, W8DVE 126, W8CCK 123, W8CMB 117, W8AND 111, W8BKM 94, W8BAH 89, W8BAC 82, W8UW 80, W8CKX 73, W8VP 71, W8CFT 70, W8JR 62. W8AQX 59, W8BBH 48, W8EB 48, W8BNC 44, W8BTT 43, W8CGS 40, W8DU 38, W8EBT 34, W8DCJ 28, W8US 27, W8CWC 26, W8EFG 26, W8DZH 24, W8EEW 21, W8KP 20, W8SG 20, W8EGZ 16, W8APT 16, W8DKG 14, W8ATV 15, W8CUL 15, W8CSS 14, W8TK 14, W8DIH 12, W8DBK 11, W8FA 7, W8CX 6, W8BDU 6, W8CHD 6, W8ADS 5, W8ARW 4, W8HH 4, W8BMX 4, W8BPH 4, W8BZL 3, W8ADL 3, W8BSR 3, W8EEQ 3, W8UC 3, W8AZU 3, W8CK 2, W8AXV 2, W8DDV 2.

DAKOTA DIVISION

SOUTH DAKOTA — SCM, Howard T. Cashman, W9DNS — W9DKL leads in traffic as usual. W9FLI has had plenty QRM from being sick to graduating exercises. W9CFU reports two new stations at Huron, W9HAF and W9GYG. W9HAF sends in his first traffic report. South Dakota went to the Ames Convention this year per W9DTZ, W9DRB, XW9DQS and W9DNS.

Traffic: W9DKL 131, W9FLI 9, W9CFU 1, W9HAF 1, W9DNS 1.

SOUTHERN MINNESOTA — SCM, H. Radloff, W9AIR — Take a look at W9FFY's total! W9DRG is building an MOPA. W9COS has dropped routine traffic work. W9FJK lists W9GTE and W9HBT as new Minneapolis hams. W9FNK installed a pair of type '10s. W9AIR released the Red Cross emergency for the Seventh Corps Area A.A.R.S. W9FAD lists W9HAI as a new one in Jackson. W9BNN is now classed with the Hi-Power boys. W9GMD is getting off to a good start. W9EAT worked PY2BF on 3.5 mc. W9EYL feels satisfied with his layout. W9DGE is building a new receiver. W9GHO spears a few on 14 mc. W9AKN has a 250-watter on 14 mc. W9DBC has the golf bug. W9EFK is too QRL to even put that last bolt into his new xmitter. W9CH has been on exhibition. W9EYS hooked up a monitor. W9BQF is now trying a dynamotor. W9CKU notes better results after replacing his splices with a brand-new skywire. W9EEB and the W9BKX ops attended the Ames Convention with the SCM. W9FKU nurses his MOPA between patients. W9FPY reports the Luverne hams attended Sioux Falls Radio Club annual picnic. W9BHZ has a dynatron frequency meter. W9TF has been kicking out fairly well. An inconsiderate tornado smashed W9BKK's beautiful 60-footer. W9DHP has been hamfesting in St. Louis and Dubuque. W9BKX has an AC SW3. W9CRQ is rebuilding his 'phone. W9FMB would like to see some hams this summer. W9BGG visited the Heron Lake and Jackson gangs. W9GTO is a new one at Blue Earth.

Traffic: W9FFY 581, W9DRG 54, W9COS 50, W9FJK 40, W9FNK 39, W9AIR 36, W9FAD 24, W9BNN 16, W9GMD 16, W9EAT 12, W9EYL 8, W9DGE 5, W9GHO 1.

NORTHERN MINNESOTA — SCM, Ray Weibe, W9CTW — New Clubs are at St. Paul, Aitkin High School and at Paynesville. The gang at Paynesville have a Naval Reserve Unit Station with a staff of 12 operators, and made the BPL. W9BHH sends in fine report. W9AAN is leaving section till fall. W9EHK is getting portable license. W9DOQ reports a bum wrist. W9FAQ is looking for traffic. W9BBL has a steady dance band job. W9BVI works plenty DX with his '52. The SCM has been on the sick list. W9BVH is rebuilding receivers. W9FNJ has hard time getting MOPA perking. W9EGU has Extra First-Class Amateur ticket. W9GKM will be gone for the summer.

Traffic: W9BRA 226, W9BHH 59, W9AAN 20, W9EHK 14, W9DOQ 10, W9BBL 4, W9BVI 4, W9CTW 4, W9FAQ 4, W9BVH 1, W9FNJ 1.

NORTH DAKOTA — SCM, Guy L. Ottinger, W9BVF — W9DGS ranks first again. W9CRL is off the air temporarily. W9DYA will be on more from now on. Two schedules are kept by W9EGI. W9BVF had QRM from college. W9DM is getting ready to close up for the summer.

Traffic: W9DGS 475, W9CRL 50, W9EGI 33, W9BVF 18, W9DM 6.

DELTA DIVISION

MISSISSIPPI — SCM, William G. Bodker, W5AZV — W5AWP has a new high-power 'phone on 3500 kc. W5AZV is planning a 14,000-kc. crystal-controlled 'phone. W5BKL has trouble getting out with his haywire antenna. W5BNW and W5BBX are graduating from high school. W5BOT was heard in Russia on 7000 kc. W5BUI will probably operate under a "9" call during the summer, as his QRA will be St. Louis, Mo. W5VJ finally succeeded in working a "6." The Jackson Amateur Radio Assn., located in the penthouse of the new 22-story Tower Building in Jackson, has had several out-of-town visitors lately, including W5BHV and W5BJT.

Traffic: W5AZV 43, W5AWP 28, W5BUI 15, W5BOT 5.

TENNESSEE — SCM, James B. Witt, W4SP — W4AFM is new RM for East Tenn. W401 has new crystal rig. W4AAD put up a new antenna. W4CW has a commercial ticket. W4RO says European signals are FB on 14 mc. in early afternoon.

Traffic: W4AFM 58, W401 40, W4AAD 38, W4CW 19, W4RP 12, W4RO 8, W4SP 3.

ARKANSAS — SCM, Henry E. Velte, W5ABI — OUR BANNER STATION this month is W5BMI. W5IQ made the BPL. W5HN has a portable license with call W5AHG. W5BRI is getting out well. W5BPE has sold out. W5ABI plans a number of changes during summer. W5SI reported by radio. W5LV has four schedules. W5BIB is building 'phone rig. W5BJR is new station.

Traffic: W5BMI 420, W5ABI 315, W5IQ 223, W5BPE 46, W5LV 31, W5RW 28, W5SI 26, W5HN 23, W5BJR 16.

LOUISIANA — SCM, Frank Watts, Jr., W5WF — W5YW advertised for traffic during the State High School Rally recently held in Baton Rouge. W5RR added a 2-stage amplifier to his receiver. W5ACY is still keeping his AA schedules. We never hear W5BJA any more. W5BPN has a new TNT. W5ASJ is new fellow for Shreveport. W5AIB is going to work some DX yet. W5VT is portable call of W5WF. Can't seem to locate W5BHV, W5ANQ, W5BDJ, W5WG, W5KC, W5NJ and several others. There will be lots of room for some good ORS stations after this month I think!!

Traffic: W5YW 224, W4WF 93, W5RR 42, W5ACY 26, W5BJA 10, W5BPN 10.

HUDSON DIVISION

EASTERN NEW YORK — SCM, H. J. Rosenthal, W2QU — At a recent meeting of the Mid-Hudson Radio Club at Poughkeepsie, plans were made to start an active Naval Reserve Unit in that Section. W2LU had the pleasure of entertaining W1KR. W2BJA reports Army Amateur net moving traffic quickly. W2CBB is moving from Rye to New York City. W2ACD is one of the main relay points in the Army Amateur Net. W2CJP will soon be heard with the call W2ZZK. W2AYK is planning a higher power transmitter. W2CGO keeps schedules with NDF and W4RE. W2ACB had the pleasure of entertaining A.R.R.L. Directors, Woodruff, Hill and Corlett while enroute to Hartford. W2UL and W2BNA have joined the ranks of ORS. W2ANV is rebuilding his transmitter. W2CTA is heard regularly in Europe on 3.5 mc. W2BSH reports Schenectady Amateur Radio Assn. had three A.R.R.L. Directors at their last meeting. W2ATM and W2BTW are handling traffic regularly. W2CL does lots of business as OO.

Traffic: W2LU 224, W2BJA 148, W2CBB 57, W2ACD 39, W2AYK 23, W2CGO 18, W2ACB 17, W2UL 14, W2ANV 13, W2CTA 12, W2BSH 10, W2BTW 10, W2BNA 8, W2ATM 7, W2CL 5, W2CJP 36, W2QU 35.

NEW YORK CITY AND LONG ISLAND — Acting SCM, W. J. Warringer, W2BPQ — Long Island: Come across with those activities we hear about. Staten Island kicks in two reports. Miss Alice Picard, W2WP, 212 Bidwell Avenue, Westerleigh, has applied for an ORS. Brooklyn: W2PF leads the pack. W2BO is installing a 250-watt final amplifier. W2CCD will spend summer at W2KW, Radio Hill, N. Y. W2BJF can't keep the birds from swinging on his Zepp. W2APK is taking a vacation now that DAIV is back in town. W2BEV says, "Inactive at present." Manhattan: W2SC expects new rig to be finished soon. W2BDJ is organizing a radio club. W2BZN has gone home for summer and has W8APK on the air. W2AOU has joined Army Net. W2BCB is back after absence of six months. W2AOY has gone to New Jersey for summer, where he will run W2BDD. W2BXW is using the new 2-volt tubes. W2BBY finds traffic very scarce. Bronx: W2BGO has a new push-pull rig working on 3650 kc. W2BPQ is looking for a job. Hi. W2APV handled death message from VP2PA. W2LW can't let the YLs alone, so schedules one. W2CWP, a newcomer, has worked 85 stations in two months. W2AFO requests being put on inactive list while rebuilding. W2VG moved again — now at 2246 Walton Ave. W2AQG has been off the air due to illness. W2ALX is back on the air. ExW2ANE has been rebitten after two year layoff. W2AII reports W2AYU and W2BLH on air in his vicinity. W2CYX is keeping traffic moving in Naval Reserve net. Long Island: W2ASS-W2BVL was tied up with the convention. W2AKC-2AMT is moving back to New Jersey. W2LR is reputed to be doing fine work as OO. W2HO is installing crystal. W2GP, well-known old-timer, was married on April 9th. Congratulations! W2AIQ makes BPL for first time. FB! Staten Island: Our YL, W2WP, wants to work all the gang. W2CKN, a new ORS, promises big things in near future.

Traffic: Brooklyn — W2PF 80, W2BO 40, W2CCD 17, W2BJF 8, W2APK 1. Manhattan — W2SC 108, W2BDJ 9, W2BBY 3, W2BXW 19. Staten Island — W2WP 9. Bronx — W2BGO 33, W2BPQ 23, W2APV 17, W2LW 15, W2CWP 5, W2AFO 5, W2VG 5, W2CYX 56, W2AII 6. Long Island: W2ASS 37, W2AKC 32, W2HO 8, W2AIQ 225.

NORTHERN NEW JERSEY — SCM, A. G. Wester, Jr., W2WR — W2AH of the A T & T Co. has been appointed OO. W2AMT has moved to Tenafly. W2CFQ has moved out of the district. W2JF goes back into the BPL. W2AOS has been appointed "Section Commander" of both the AA and U.S.N.R. systems. W2CWK did some very unusual work. W2AGX is playing with ultra high frequencies. W2CJX got a new car. W2AMR has had crystal troubles. W2BPT has made some observations of YL operators and thinks it would help the sex to get into radio. W2MQ joined the U.S.N.R. W2CDQ worked Jap J5CC. W2AIF burned out some equipment. W2CHZ is looking for traffic. W2BYX is QRL with flowers, garden and office. W2BJZ had the pleasure of his first VK QSO. W2AUP handed in a fine report. W2CAE, our new comer from the 7th dist, is moving again. W2CLX will welcome all the schedules he can get.

Traffic: W2CFQ 11, W2JF 66, W2AOS 68, W2CWK 16, W2AGX 3, W2CJX 12, W2BPY 38, W2MQ 78, W2CDQ 8, W2AIF 5, W2CHZ 1, W2BYX 2, W2AMT 31, W2BJZ 1, W2AUP 21.

MIDWEST DIVISION

NEBRASKA — SCM, S. C. Wallace, W9FAM — W9EYE leads the ORS this month. W9FAM received Jr. Opr. W9FWW is gradually coming to the front. W9FUW is still punching away. W9EHW, W9BBS and W9GDL have the rebuilding fever. W9BQR says hard time to QSO the SCM. W9DTH is trying his luck on 14,000 kc. W9BNT is still doing FB traffic work. W9GRQ applies for ORS. W9EQS, W9DHA, W9ESY, W9GAS and W9DHC report.

Traffic: W9EYE 70, W9FAM 46, W9FWW 26, W9FUW 18, W9EHW 3, W9BQR 1, W9BNT 170, W9GRQ 7, W9EQS 4, W9DHA 8, W9ESY 8, W9GAS 7, W9DHC 125, W9BJI 41, W9EDI 18.

IOWA — SCM, George D. Hansen, W9FFD — W9IO forges ahead and makes the BPL. W9FFD says "thanks to the Army schedules" for keeping the total up. W9FYC, W9GP, W9EFU, W9DUN, W9EIV, W9DNZ, W9ACL, W9FZO, W9DFZ, W9EOP at W9GMX, W9CKD and W9AHX are all doing good work. W9EJQ manages to get a few in between business QRM. W9BFL reports from the Capitol City. W9CAC is an aspirant for ORS. W9AG tells of some nice traffic work. W9BJP says QRN getting bad. W9FEB is new ORS. W9BCL is going FB with a new MOPA. W9DIB sends in his bit.

Traffic: W9IO 262, W9FFD 150, W9FYC 71, W9GP 64, W9EFU 41, W9DUN 41, W9EIV 40, W9DNZ 40, W9ACL 39, W9FZO 38, W9DFZ 38, W9EOP 28, W9CKD 27, W9AHX 26, W9EJQ 21, W9BFL 21, W9CAC 13, W9AG 12, W9BJP 8, W9FEB 7, W9BCL 6, W9DIB 1.

KANSAS — SCM, J. H. Amis, W9CET — W9ESL leads the Section. College QRM is nearly over for W9JA. W9NI is rebuilding. W9CET has a new power supply. EURX 191 reports hearing W9CFN. Six schedules keep W9FLG busy. W9CXW is using both 7000 and 3500 kc. W9CKV is keeping a schedule with NDP. W9BQW has a 250-watter. W9BVQ is on 1750-kc. 'phone. W9HL has a schedule with the RM. W9GHI is graduating from high school. W9BNU is awaiting renewal of his license. W9BNX wants traffic on 3500-kc. 'phone. Spring fever took a lot of W9FXY's time. W9ERR will be on the air at his home station, W9CDP, during vacation. W9ESW is on 3500 kc. with a '10.

Traffic: W9ESL 95, W9JA 71, W9CKV 57, W9BQW 60, W9CFN 40, W9FLG 45, W9CXW 32, W9CET 31, W9BGL 31, W9HL 23, W9BNX 17, W9FXY 11, W9ERR 10, W9ESW 12, W9GHI 10.

NEW ENGLAND DIVISION

CONNECTICUT — SCM, Fred A. Ells, Jr., W1CTI — W1BPC is a new man at So. Glastonbury. W1BFU is on 3500 kc. W1BAI was heard in Australia on 3500 kc. W1BFW is a new ham in Portland. W1CTB is on 14 mc. W1BGO lost his 65-foot stick. W1AJB is QRL. W1AUT is experimenting with a new MOPA 'phone. W1KV is QRL with the YL. W1CKQ is waiting for the depression to pass over. W1AEV is again on the air after moving to new QRA. W1BDI picks up the broadcasts from FXC on 8000 kc. and QSP's to W3BWT. W1APJ is sending in his application for

ORS. W1AVB will be ORS when this is read. W1BVW is one of the quiet gang — no news on his form one. W1HQ is working real DX on 14095 kc. W1BGP is reaching out on 3.5 mc. W1ES schedules W2WP. W1BHM is on 14 mc. W1BXT schedules W1BDC and W1BTF. W1AXB was QSO W6AF on 3.5. W1ADJ, Vice-Pres. of Conn. Brass Pounders Assn., hands in his first report. W1FL got his report in on time this month. W1BBU schedules W1CDS. W1ZL will be in town for a couple of months. W1AOK says W1AFB gets all the Hartford traffic. W1TD will be all set with a new antenna soon. W1ASP will try 3973 kc. as soon as he can revamp his outfit. W1AMG has been very QRL. W1BNB keeps busy in the garden. W1BWM rebuilt his transmitter. W1AQF has been transferred to Waterbury. W1AUB handles his traffic on 'phone. W1OS, W1AOW and W1ACQ paid a visit to the SCM, but no one was home. W1AZG schedules W1ZZA. W1AMQ has been off the air visiting WSAQQ, WSSZ, W8DSS and W8BXY. W1CDS rebuilt his transmitter. W1AAM is building a new power supply for his MOPA. W1HD is rebuilding his 3.5 transmitter. W1QV reports on the gang up his way as follows: New stations W1BPB and W1CNC. W1ABN is working good DX. W1BFS is having trouble with 3.5 mc. W1QV has separate '52s on 28mc. and 56 mc. W1CTI is very QRL building a new home. The Conn. Brass Pounders Assn. is holding meetings every Thursday evening at the club house in Noroton. Visitors welcome.

Traffic: W1AFB 448, W1MK 438, W1YU 287, W1CJD 203, W1UE 91, W1BEO 122, W1BDI 75, W1APJ 74, W1AVB 73, W1AOI 55, W1CTI 44, W1BVW 41, W1ES 29, W1HQ 14, W1BGP 13, W1BHM 8, W1BXT 7, W1AXB 7, W1ADJ 6, W1FL 6, W1BBU 6, W1ZL 6, W1AOK 5, W1TD 4, W1ASP 4, W1AMG 4, W1BNB 4, W1ABN 4, W1BWM 3, W1AQF 2, W1AUB 2, W1OS 2, W1AZG 1.

WESTERN MASSACHUSETTS — SCM, Leo R. Peloquin, W1JV — Western Mass. is at last coming into its own and is already regarded as a good traffic handling section. W1NS takes the honors this month. W1DR also did a fine job. W1BVR has just bought 2-30 watt Mueller tubes. W1ASY and W1BNL are rebuilding. The Blackstone Valley Radio Assn. have opened their new shack at Lake Nipmuc with call W1BFD. W1BXF blew his power supply. W1BKS blew out 13, (HI) new 2-volt receiver tubes. W1AZW has applied for ORS and OBS appointments. W1BRD has a new receiver.

Traffic: W1NS 171, W1DR 109, W1ASU 53, W1BVR 52, W1AIF 46, W1AZW 40, W1JV 38, W1AJD 28, W1KT26, W1BRD 24, W1BXF 15, W1ASY 12, W1APL 11, W1BNL 8, W1BIV 8, W1BVV 1, W1CCH 10.

NEW HAMPSHIRE — SCM, V. W. Hodge, W1ATJ — The report for May *QST* from this Section was lost in the mails. It was posted same as usual, but HQ reports it didn't arrive there. W1CCM has moved downstairs. W1AUY works the west coast easily on 'phone. W1AVL, W1AVJ and W1AVG attended the convention. W1APK piled up 2500 points in the 'phone contest. W1CAF has put in crystal on 7083.6 kc. W1UN handled a bunch of traffic from Dartmouth. W1BLA reports several stations in Dover waiting for their licenses. W1BVJ is a new ORS. W1BAC reports QRM from school and band practice. W1BNJ is second op at W1CAF. W1BFT is trying 'phone. W1BBF is cramming for exams. W1IP still pounds out his big share! W1AXL is a new ham in North Charlestown. W1BII was a recent visitor at the SCM's.

Traffic: W1IP 175, W1UN 29, W1BVJ 36, W1BBF 20, W1ATJ 20, W1CAF 8, W1APK 5.

EASTERN MASSACHUSETTS — SCM, Miles W. Weeks, W1WV — W1BGW and W1ASF make BPL. W1BGW is now ORS. W1BZQ is using a 211 with a type '45 modulator with expectations of a '04A linear amplifier soon on 3.5-mc. 'phone. W1AAT reports good conditions on 3.5 mc. W1CCP and W1CAW have their 2nd Class Commercial tickets. W1ATX was heard in Germany on 3.5 mc. W1CQN continues several 3.5-mc. schedules. W1KH and W1WV coöperated to QSO VQ4CRF, on 14 mc. W1ACD contemplates C.C. soon. W1LM is on summer vacation. W1SL is using crystal on 3.5 and 7 mc. Honeymoon QRM is letting up at W1ABG. W1WU reports QSO VK and K6 on 7 mc. W1ADK found DX on 14 mc. better than traffic on 3.5. W1AFP has been trying 56-mc. 'phone. W1AAL is building new crystal rig for 'phone and c.w. W1CHR reports traffic very poor. W1ASI handled quite a little traffic on 7 mc. W1AKY has been appointed OBS and will send out the OBs by c.w. and 'phone on 3.5 mc. W1BNJ, who has been operating at W1CAF, will shortly be on from his own station. The following ORS failed to report this month: W1KY, W1BXB, W1AZE, W1ACH, W1ANK and W1ME.

Traffic: W1BGW 83, W1ASF 74, W1KH 59, W1ASI 58, W1AAT 34, W1AFP 30, W1AAL 25, W1BZQ 24, W1WV 21, W1ATX 21, W1CQN 16, W1CAW 16, W1LM 15, W1ACD 12, W1ABG 11, W1SL 10, W1BNJ 10, W1CHR 5, W1CCP 4, W1WU 3, W1ADK 1, W1LQ 89.

VERMONT — SCM, Clayton Paulette, W1IT — W1CGX reports new ham, W1CIY. W1ATF reports following guests at his home: W1BD, W1AOA, W1OI, W1AXN and W9BBI. W1BD put up new Zepp. W1BJP says not much doing. W1AXN reports working his station from camp at Lake Iroquois under Portable license; call letters same. W1AOA is QRL school. W1IT so QRL thinks he will have to resign SCM job.

Traffic: W1CGX 134, W1ATF 94, W1BD 65, W1BJP 20, W1AXN 19, W1IT 5.

MAINE — SCM, G. C. Brown, W1AQL — W1ATO reports by radio. W1ACW has worked five continents and sixteen countries. W1BLI has been working on 14, 7 and 3.5. W1BEU reports an old timer, Harris Day, coming back on the air. W1BFA recently read an article in a New England newspaper which asked the following questions: "Where are stations WQSA4, WQSA5, WQSY and W1BASK?" Hi. The gang from Bangor and Ellsworth were very much pleased to receive a brief visit from our old friend, "Boot Black," W1LQ, of Wollaston, Mass.

Traffic: W1ATO 168, W1ACW 65, W1BLI 32, W1BEU 24, W1BFA 1, W1AQL 10.

RHODE ISLAND — SCM, N. H. Miller, W1AWE — W1GV makes the BPL. W1BMU is a new ham. W1CAB is handling lots of traffic. W1MO likes 14 mc. W1BDQ works everything he hears. W1ATM is a new ORS. W1BLJ has a new receiver. W1AWE has two schedules. W1ARK has an MOPA transmitter. W1FU and W1EX are doing 15 days' duty at a compass station. W1BML, W1AMD, W1CNY, W1BOP are still at WJAR - W1DZ. W1AFO has a good 'phone. W1BGA has his crystal working. W1CPV worked Nicaragua. W1ASZ is working them all. W1BTP is going full blast. W1AAD gives most of his time to rag-chewing. W1AMU is operating on all bands. W1BQD is on 14 mc. W1AGI and W1MG are going strong on 14 mc. W1SY has a nice low power 'phone. W1RJ is perking on 3.5 mc. W1JJ is busy with BCL business.

Traffic: W1GV 89, W1CAB 56, W1AWE 37, W1ATM 26, W1CPV 24, W1BGA 12, W1ASZ 12, W1MO 8, W1BDQ 8, W1AAD 7, W1BLJ 5, W1BQD 4.

NORTHWESTERN DIVISION

IDAHO — SCM, Oscar E. Johnson, W7AKZ — W7KG will increase power to 100 watts. W7BAU and W7BBE report for the first time. W7ACD will transmit tests on 28 mc. during July, August and September. W7ACP is president of the Idaho Amateur Radio League, a new organization. W7QD worked ZS5X on 14-mc. 'phone! W7AUR is on after a long vacation. W7ALW is still busy. W7ACO is having troubles with antennas. W7AFT has a new monitor. W7AT has an Extra First-Class ticket. W7AKZ finds conditions rotten.

Traffic: W7AT 18, W7AFT 10, W7ACP 73, W7ACD 9, W7BAU 1, W7AKZ 10.

MONTANA — SCM, O. W. Viers, W7AAT — W7HP likes to chew the rag. W7ASQ was in Denver a few weeks at W9CAA. W7CU is a new ORS. W7AHF is rebuilding. W7AMK, a NON-ORS, never fails to report every month *ON TIME!* W7BCA has been getting good reports. W7AOH is waiting for a new 75-watter. W7AYR is the live wire in the Anaconda gang. W7AFU keeps schedules west. W7AAT has been doing some reconstructing.

Traffic: W7AAT 114, W7HP 17, W7ASQ 22, W7CU 29, W7AHF 14, W7AMK 4, W7AFU 6.

WASHINGTON — SCM, Eugene A. Piety, W7ACS —

W7OI takes the lead this month. W7QI spends most of his time working. W7AVM has a new MOPA. W7AG-SL visited a few hams at Wenatchee. W7TX is holding down his Alaskan schedules. W7RT is busy raising subscriptions for the *Oscillator*. W7APF helps to keep Tacoma on the air. W7WY and W7AVN are busy with Navy Net work. W7AQ has moved to new and larger quarters.

Traffic: W7OI 100, W7QI 34, W7AIX 17, W7TX 12, W7ADS 14, W7APF 10, W7AG 8, W7AVM 2, W7AYO 1.

PACIFIC DIVISION

SAN JOAQUIN VALLEY — SCM, E. J. Beall, W6BVY — Thanks, Gang, for the FB reports sent in this month. W6AOA leads in traffic with a splendid total. Welcome, Kern County, into the San Joaquin Valley Section. W6DQV connected with G5BY. W6BBS is a YL op at Wasco. W6ENQ is still rebuilding. W6ENH has a junior op. in his family. (Congrats, OM.) W6AOA sent in a fine report for the southern gang. W6BJE is kept busy with schedules. W6AV dropped in on the SCM for a conference. W6CXT is consistent with his schedules. W6BVY does not understand all he knows about MOPAs. Fresno has been quiet the past few weeks. How come, W6AHO? . . . W6FFP continues to hold down his Oriental schedules. W6QA has moved to a new QRA for antenna purposes. W6FAN and W6BBC are now on the job in Stockton. W6DCI is in Reno temporarily. W6FY is seen hanging around active stations lately. W6KU and W6CLP unheard this month. W6BQC is a new ORS.

Traffic: W6FAN 53, W6BBC 34, W6DQV 58, W6FFP 152, W6EJU 146, W6CXT 75, W6ETN 81, W6BJE 61, W6BQC 27, W6AOA 544, W6BVY 89.

EAST BAY — SCM, J. Walter Frates, W6CZR — W6ASH covered himself with glory again this month with one of the highest totals ever handed in by one man in the three and a half years that the present SCM has been in office. W6ALX came in second with his usual fine, consistent work. During the past month he had the aid of old W6IP, who contacted P. I., Guam, China, and a few way points. W6BI has a schedule with W6UO in Nevada. W6CTX is back in the traffic game again. W6NM with W6DKO and W6DTM at the key is still pounding away. W6CIE turned in a fine total. W6AIN broke out with a sizeable total. W6ATJ has just finished a 50-watt crystal-control job. Rain or shine, W6RJ continues to do his steady work. W6CGM says his annual power leak is working again. W6DQH is busy installing the new KRE transmitter. W6CBE says by the time this report is published he will have crystal control. W6BUX says all of his traffic was handled on 'phone. W6BMS is going to build a frequency standard. W6ADM makes his bow this month with traffic.

Traffic: W6ASH 765, W6ALX 205, W6BI 111, W6CTX 90, W6NM 84, W6CIE 77, W6AIN 52, W6ATJ 38, W6RJ 34, W6CGM 30, W6DQH 28, W6CBE 27, W6BUX 25, W6BMS 17, W6ADM 16, W6BBJ 15, W6BZU 15, W6FAJ 3, W6CZN 2.

SANTA CLARA VALLEY — SCM, F. J. Quement, W6NX — Congratulations, you brass pounders of this Section! Through your individual coöperation and interest all previous records of this Section were broken, lacking only 11 messages to make it 2000. Again W6YG leads with the old reliable, W6HM, second. W6ALW and W6ASE and W6YU of San Mateo accounted for 350 messages. W6AMM continues his PI schedules. W6BMW handled the usual traffic. W6DMJ is a new reporting station. W6BAX has worked 73 countries. W6YL has schedule with W6YG. W6PN and W6FBU are closed for the summer. W6ACV has gone to Alaska for the summer. W6CEO and W6BHY handled many messages for San Josans. W6FBW was appointed ORS. W6DCP is coaching his YL for license.

Traffic: W6YG 564, W6HM 474, W6ALW 211, W6AMM 184, W6YU 148, W6BMW 80, W6ASE 79, W6DMJ 30, W6BAX 27, W6YL 23, W6PN 20, W6ACV 16, W6CEO 34, W6BHY 52, W6FBU 11, W6FBW 19, W6DCP 7, W6NX 10.

SAN DIEGO — SCM, H. A. Ambler, W6EOP — W6EPF leads this month. W6CTP is working DX. W6BAM rebuilt. W6APG is taking out ORS ticket. W6EPZ has a 50-watter. W6ADC is thinking of moving east. W6ACJ and W6DNS are building new receivers. W6EOP is QRL. W6AYK is looking for schedules east. W6BKX is on after vacation at sea. W6EMA has new zepp. W6AJM is QRL BCL sets. W6EOL will soon have new outfit. W6QY has new shack. W6DNW is heard after midnight. W6CTR got promoted in Police Department. W6HY puts out more speed tickets than QSLs. W6DAI is on crystal 'phone. W6DNL is building portable. W6BFB is building crystal outfit. W6AEP has schedule with Hawaii.

Traffic: W6EPF 12, W6EOP 11, W6CTP 9, W6AEP 9, W6APG 8, W6BAM 3, W6EMA 3.

SACRAMENTO VALLEY — SCM, Paul S. Farrelle, W6AXM — W6EOC is a new OBS. W6DKW is building a dynatron. W6EOU doesn't like Schnell's idea of low power. W6QT has crystal going FB. W6EJC is building 14-mc. 'phone. W6EDV has an FB 'phone on 3.5 mgc. W6EMK is going for the YLs. W6DKH, W6CMA, W6ADS, W6ENC, and W6BHE are new men in this Section. W6DYF is still using low power. W6ECL is back on after a long absence. W6AK and W6FW are thinking about joining U.S.N.R. W6EVS is building crystal. W6GR and W6GF, two old-timers, are back again. W6UM is getting the fever. Am sending ORS tickets to W6TM, W6AIM, W6BSQ. WANTED, a couple of good RMs to build up a reliable traffic net in this Section. W6CGX wants to be an ORS. Ex-U6LS is getting back on with MOPA crystal. W6CGJ is in line for ORS. W6EMX is going back to Alaska. W6EOU reports. W6CDC is QRL drawing plans for future Sacramento buildings. W6EAG is building MOPA. W6JB lost her license. W6ELC is heard quite often. W6BiD isn't heard any more. W6DLB is using low power. W6DGQ is working DX on 14 mcg. W6EEN is "General Janitor" at KFBK. W6DON is thinking of getting married. W6BSN says the hams get his goat by being off-frequency. W6BBW is going strong. W6CKA gets out FB. W6BYB is going on high power. We were honored this month by a visit from Cy Russell, USMC, OM1TB, who gave us a very good talk on ham radio in Guam. W6AIM is still working on 7-mc. band. KA1NF and your SCM are going to give a cup to the ham in this Section handling the most traffic between Manila and U.S.A., so get the dust off your keys.

Traffic: W6AXM 1810, W6QT 500, W6BYB 130, W6EFM 120, W6EOU 35, W6AIM 17, W6CMA 15, W6EOC 10.

LOS ANGELES — SCM, H. E. Nahmens, W6HT — Please note new address of SCM: 1505 East 63rd Street, Long Beach, Calif. W6EGH comes back to the fold with flying colors and a grand total. W6EGK makes BPL both ways. W6DAK and W6DER make it on deliveries. W6DER's new crystal heap drags in the DX and traffic. W6AKW reports another new ham, W6CBT. W6ETJ has good schedule with K6COG. W6DEP got his final amplifier to work at last. We're glad to hear W6DVA is back on his feet again. W6BCK finally kicks through with a report. W6CFN is a new ORS. Ex-9AQB now signs W6SN. W6BGF sends in dope on Puente Amateur Radio Club. W6CZZ and W6DLI are both active in A.A.R.S. W6CVZ won a DX contest between himself and W6EIN. W6AKD is now feeding an '04A with a couple '10s. The April 'phone contest put a terrible strain on the junk at W6CZT. W6ID is now located at Hammond, Ind. W6EQW is busy with USNR. W6CVV wants an ORS. The 612-foot transmitting antenna at W6AM now has average height of 75 feet instead of 60. W6DWW handled some important traffic. A mere choke kept W6EZK from getting d.c. on 14 mc. W6CMU sends first report. Activity increasing at W6ESA. W6ZZA worked five countries from a hotel in San Francisco. W6AZL has new MOPA. W6DNA dropped in from Lancaster to visit the SCM. W6ANN reports Europe coming through on 14 mc. W6ASM is back on the air. W6BV, W6CSC and W6UB are now burning the ether at Redondo Beach, according to W6ACL. W6VH spends most of time on 14 mc. Received a black-lined card from W6BVZ reporting death of 50-watter. Hi! W6HT has moved out in the sticks. W6DOZ worked France on new crystal rig. Mrs. W6AWY now signs W6ATE. W6FFF has QRO'd to a '10. OM Stork has been seen hovering over the shack at W6AWY. W6VO is back from Mexico.

Traffic: W6EGH 791, W6EGK 221, W6DER 134, W6AKW 108, W6ETJ 105, W6DAK 81, W6CFN 80, W6DEP 71, W6DVA 66, W6BCK 64, W6SN 63, W6BGF 52, W6CZZ 35, W6DLI 35, W6CVZ 34, W6AKD 29, W6CZT 25, W6EQW 24, W6CVV 22, W6AM 20, W6DWW 18, W6EZK 16, W6CMU 13, W6ESA 12, W6ALQ 8, W6ZZA 8, W6AZL 7, W6DNA 6, W6AZU 5, W6ANN 5, W6DZI 5, W6ASM 4, W6FAV 4, W6ACL 3, W6MA 3, W6VH 2, W6BVZ 2, W6HT 2.

SAN FRANCISCO — SCM, C. Bane, W6WB — W6CK is operating entirely on 'phone. W6EKC tops the list this trip. W6ZS comes along in second place. W6DFR reports as usual. W6ABB took a big jump "down" this month. W6CAL is monkeying on 28 mc. The Convention Committee, under the very able guidance of W6PW, is hard at work to put over a real session for the gang. "Pacific Division Conventions have always gone over with a bang!" San Francisco won't be any exception! W6DPF bobbed up again this month. W6DZZ blew up his fifty. W6MV says an ORS appointment would be welcome. W6VK, a newcomer, reports for the first time. W6KJ hasn't missed a report in two years. W6BVL wants to know what you have to do to be an ORS.

Traffic: W6EKC 199, W6ZS 134, W6DFR 97, W6CK 91, W6ABB 66, W6CAL 45, W6DPF 33, W6DZZ 26, W6MV 23, W6VK 8, W6KJ 7, W6BVL 2.

ARIZONA — SCM, H. R. Shortman, Jr., W6BWS — W6CPF leads in traffic with splendid total. W6EFC places well in the BPL. W6EEB reports having a 50-watter on 7 mc. W6DIE has returned from the Radio School in Los Angeles. W6CDU and his YL decided that two should be one. W6DQW reports leaving for Detroit where he will be on with W8LQ. W6BWS is awaiting replacement on a defunct fifty. W6BJF won a fountain pen as first prize in an Army Amateur QSO Contest. He reports another new man in Phoenix signing W6AMV. Ex-W6EAA reports that he is operating Morse for KTAR. W6BLP is just completing a new MOPA. W6BWS, W6DHA, and Ex-W6DGY visited W6BLP. W6EFC, who was injured badly in an explosion, is recovering rapidly. W6BJF is a newly appointed OBS W6EOF is still at KGUO. W6EH is in Big Spring, Texas, operating KGUG. W6DGN has gone to Chicago. W6ASA is finishing up at the University of Arizona. W6AAM is now in the Radio Interference Department of the Phoenix Power Company. W6CEC turns in a nice total. W6UP reports on activities in Ajo. W6EFN is doing good work on 14, 7 and 3.5 mc. W6CKW boasts a nice 3.5-mc. 'phone. W6CBA is doing his stuff with a pair of '45s. W6UP was formerly 7PU of Montana.

Traffic: W6CPF 434, W6EFC 285, W6CEC 57, W6EUT 46, W6BJF 22.

NEVADA — SCM, Keston L. Ramsey, W6EAD — W6AJP made the BPL this month. W6UO sends in a fine report. W6BYR is trying to get some modulation on his 'phone. W6CRF handled a little traffic with 'phone. W6DCI from Modesto is in Reno for a stay. W6CDZ is giving up ham radio for a while. W6EAD is building a push pull transmitter.

Traffic: W6AJP 182, W6UO 161, W6BYR 37, W6CRF 27.

HAWAII — SCM, L. A. Walworth, K6CIB — This report was received at W6FFP by radio from K6COG and mailed to HQs. K6YAL is trying to excel K6YAJ by also building a new shack. McKinley High School Club put on a two-way radiophone exhibition for the Rotary Club of Honolulu and with K6CPO located in Rotary Headquarters were very successful. K6YAJ is helping Lahainalu Tech. get ready for its centennial celebration. K6COG and K6ERH were successful in contacting F8FR. K6DV rolled up a big traffic total with K6FCX second and K6COG fourth. All three made BPL. K6EXJ leaves Aloha land soon for Fort Benning, Ga. K6ERH plans on becoming a W9 with HQ in Chicago. K6BQJ is still busy building a modern s.g. receiver. K6DMU reports Luke Field will soon have active stations again.

Traffic: K6DV 398, K6FCX 313, K6FEZ 156, K6COB 145, K6AJA 137, K6DMM 40, K6CRU 7, K6CMC 5, K6ERO 3, K6CIB 3, K6YAL 2, K6CCS 2, K6ENE 1, K6BOE 1.

PHILIPPINES — Acting SCM, John R. Schulz, KA1JR — This report was received at W7ALM by radio from KA1JR and mailed to HQs. KA1CM is using crystal control on 7 and 14 mc. KA1HR continues the splendid work. KA1SL reports completion of his crystal transmitter. KA1CE complains of QRM from KA1ZA. KA1SP is newly married. KA1NF worked Army planes on maneuvers. KA1EL has returned from Baguio. KA1ZA is busy building a BC set. KA1CO is DXing. OM1TB works on 14 and 7mc. KA1JR is busy making a new 'phone rig.

Traffic: KA1HR 543, KA1SL 404, OM1TB 298, KB1JR 149.

ROANOKE DIVISION

WEST VIRGINIA — Acting SCM, D. B. Morris, W8JM — W8OK has highest total of month. "The Mountaineer Brass Pounder," W8IB, reports new ham, W8EGS. W8BOK has visions of two '52s on 14 mc. W8DRL wants to sell out. W8HD is our "old reliable" when it comes to schedules. W8TI is going strong. W8BWK was heard in Russia on 14 mc. The West Virginia Amateur Radio Assn. held their monthly meeting in Morgantown, May 3rd; a record crowd was on hand. All meetings from now on will be held at Fairmont, West Va., on the first Sunday of each month. All the gang is invited to attend. W8BDP has crystal on 14 mc. W8ESQ, W8EHA and W8EGS are new hams. W8DSO is installing 500-watt crystal-controlled job for 3500 kc. W8JM chases radio bugs for the local power co. W8CAY is going strong in U.S.N.R. The following hams are now ORS: W8JM, W8BOK, W8DPO, W8HD, W8OK, W8CBV, W8BWK, W8TI, W8CDV,

Traffic: W8OK 132, W8IB 91, W8BOK 47, W8DRL 32, W8EGS 36, W8BDP 22, W8CAY 16, W8HD 12, W8TI 11, W8BWK 8, W8DSO 7, W8JM 5, W8ATE 5, W8BTV 3, W8AYK 2, W8AJK 2, W8DSJ 1.

VIRGINIA — SCM, J. F. Wohlford, W3CA. W3FJ will have 100 watts at National Guard camp this summer. W3AAJ attended the Danville hamfest. W3AMB won the Virginia QSO Contest. W3CFL took in the hamfest at Danville and won a type '49. W3HL is on irregularly. W3BEJ has transmitter on 7000 kc. W3BAD is back on air. W3BLE is working on CW. W3BEB is working overtime on 'phone. W3BZ reports that trees surrounding his antenna system keep him off the air now. W3AGH is doing good work. W3BBA and W3BKJ are now active at Glen Allen. W3BBX has a 1931 note. The flower and vegetable garden and chicken ranch keep W3BGS busy. W3FX is back on air. W3KG is awaiting renewal of license. W3BLU is working overtime now. W3CXM leads in traffic as usual. We have heard nothing from W3WO since he left for a fishing trip one morning. W3ZA is still hammering away with 'phone. W3BDZ is making a few changes in his outfit. W3CA is rebuilding the complete station. W3HY leaves us for the summer.

Traffic: W3CXM 414, W3FJ 73, W3AAJ 28, W3HL 15, W3AGH 5, W3BLU 128.

NORTH CAROLINA — SCM, H. L. Caveness, W4DW — Winston-Salem has the most active radio club we know of. W4AHF has completed a four-stage crystal rig. W4APZ is a new ham. W4OG needs a little more power. W4IF has his receiver trouble ironed out. W4ABT visited W4EC and W4FT. W4ATC will be off the air for the summer. W4AHS-W4API is attending the R.C.A. Institute in Philadelphia. After school is out W4TN-PBN will be all over all the amateur bands. W4AIS is YLing too much for the good of amateur radio. W4RX reports some good DX. W4NG is helping W4AA rebuild. While W4AA is being rebuilt, W4ABC is being used and sends in a good report. W4PBO worked FX, an oil expedition on the Orinoco River, S. A., on May 14th. W4AEL is after a good frequency meter. W4AGX is on the air with a peppy crystal outfit. W4AAE is going to 14 mc. W4AVK in Albemarle and W4AVE in Boiling Springs are new hams. W4ABW is considering making an operator out of the OW. W4TR will rejoice when school is out so that he can start on a big transmitter. W4RE is helping some prospective hams with theory and code. W4EG is still working good DX.

Traffic: W4ABC 57, W4AEL 45, W4DW 34, W4AIS 16, W4PBO 16, W4EC 10, W4RE 10, W4ABT 9, W4AAE 6, W4BW 6, W4TR 6.

ROCKY MOUNTAIN DIVISION

UTAH-WYOMING — SCM, C. R. Miller, W6DPJ — The U A R C elected the following officers for the coming year: W6DWH, President; W6DFL, Vice-President, and W6BTX, Secretary-Treasurer. W7AWZ has been chasing DX. W6DAM is looking for traffic. W7HX reports business on the bum. W7AAH is too busy to pound brass. W6DPO pushed through a few. W6BTX will be away this summer. W6DPJ is in the Army Net. W6DFL conducts a weekly code class. A room has been rented by the U.S.N.R. unit in Salt Lake City, and a crystal-control transmitter installed.

Traffic: W7AWZ 38, W6DPJ 22, W6DAM 13, W6DPO 10, W7HX 10, W7AAH 10, W6BTX 4.

COLORADO — SCM, E. C. Stockman, W9ESA — A Section Hamfest sponsored by the A.R.O.D. was held at the Coffee Pot, 15 miles south of Denver, May 16th. There was a good attendance, including Director W9AAB. W9HGS-W9HFS will be located at Camp Audubon, Ward, Colo., this summer. W5ARV-W5BUA will be the operator. W9EAM, W9EKQ and W9EPC licenses have expired. W9DNT reports W9EDH received his broadcast ticket. W9GLP has an MOPA rig. W9APZ will soon have 'phone going. W9EFP is busy with farm work. W9BYC reports increase in traffic. W9FRQ has a new crystal outfit on 7 mc. W9GNK sends in nice report. W9FPZ is now an ORS.

Traffic: W9EAM 64, W9ESA 62, W9BYC 43, W9DNP 42, W9FRQ 32, W9FXP 11, W9FXQ 7, W9GBQ 5, W9APZ 3, W9CDE 1.

SOUTHEASTERN DIVISION

WESTERN FLORIDA — SCM, Edward J. Collins, W4MS — Our Route Manager, W4CB, has moved back into his shack. W4QR has been building a portable transmitter for camp. W4SC has been active in F.N.G. work. W4AAX is burning up the air with his 'phone. W4AUA is working hard to get his U.S.N.R. gang together. W4ARD-W6FCY reports that flying kept him pretty quiet. W4ATN, a newcomer, is also W6IM. W4ART is on with low power. W4ARV is another low power station. W4ASV is going to rebuild. W4ALJ has wrecked his MOPA. W4VR and W4PN have been very quiet. W4AWC is a newcomer in Pensy. W4ADV's brother just received his call, W4AWJ. W4QK has worked two districts, the fourth and sixth. W4QU is experimenting with low-power 'phone. LA2W was a recent visitor to the ham stations of Pensy. Three new stations in Marianna are W4ASG, W4AUV and W4AUW. W4KB has been getting his station all cleaned up for a hamfest at his home. Work keeps W4DP from handling traffic. W4AFT has at last worked a "VK." W4AQY has been busy graduating. W4AOO is moving his 1750-kc. 'phone down to 3500 kc. W4FV keeps a schedule with NN1NIC. W4UW-W5NO is home on a vacation. W4MX is having receiver trouble. W4HQ is busy with U.S.N.R. ExW4ACO is about to get wed. W4RK is trying to find a good station location. W4MS has a new screen-grid det. receiver. W4QR received his ORS and OBS appointments this month.

Traffic: W4FV 25, W4MX 16, W4SC 13, W4ARD 8, W4QR 8, W4ACB 6, W4MS 7.

ALABAMA — SCM, Robert Troy, Jr., W4AHP — W4APU has a '45 on 14 mc. W4AJR has dead storage battery. Hi. W4TI has moved to Greensboro. W4RS was in a "9 district" hookup on 'phone. W4DS worked his first Aussie. W4KP is using a '50. W4AHP is recovering from an operation for appendicitis. W4ASM is putting in a second transmitter. W4FI has a high-quality 'phone. W4IA has installed a double-button mike. W4AEZ is considering high-power 'phone. W4AP is working them everywhere. The SCM enjoyed a visit from W4CB.

Traffic: W4AIH 46, W4ASM 24, W4KP 22, W4AAQ 10, W4DS 6, W4RS 2.

EASTERN FLORIDA — SCM, E. M. Winter, W4HY — Route Managers: W4AAB, W4SQ, W4NN. W4AJK and W4OK reported. W4OK is using TNT circuit. W4SY and W4AJK have gone together to make one station. W5RU is building an MOPA. W4AQT, the Plant City Radio Club station, is on the air. W4AGN handled lots of traffic. W4JO won the annual trophy offered by the Miami Amateur Radio Club in their All States QSO Contest. W4BT came in second. W4DC got on the air for a total of 14 messages. W4SK sent his March report direct to QST headquarters. W4AII handled lots of Navy Net traffic. W4TK says he's disgusted with the wicked QRN. W4BG says their best DX was Cuba. W4FM got on the air twice this month. W4ATM overhauled his receiver. W4ATG has a separate set for 'phone. W4FQ is on. W4AIV is going on a vacation. W4WS worked in the Army Net and Knights of the Kilocycles. W4AJK, W4BN, W4SQ, W4AJK, W4ABL, W4SY, W4TB, W4BQ, W4ACC and W4AC have started a Radio Club in Tampa. W4AJD and W4CK are Official Observers. At the banquet given by the Miami Amateur Radio Club, 32 fellows were present. W4GD is away on vacation. W4TQ says traffic is very quiet. W4AOV is Lawson Hill's new call. W4AGN is used exclusively by the Naval Reserve. W4AOV expects to use two '45s in push-pull. W4ABF is going back home from school. W4AAB is very quiet this month. W4WW is on again with a '10. Ex-W4ABL, Marion Gulick, expects to get back on this summer. W4AKJ will be on shortly with a new rig. W4QL is going away for the summer and must resign as Route Manager. The Plant City Radio Club now has 8 members. W4ZV has changed from Hartley to a push-pull. W4ZU seems to be able to make an '01A do what a '10 should do.

Traffic: W4AQT 8, W4TQ 4, W4ABF 20, W4AAB 2, W4ASK 1, W4AQT 7, W4AGN 60, W4JO 12, W4DO 14, W4AII 18, W4AOM 63, W4SK 4, W4BG 5, W4FM 6, W4ATG 4, W4WS 22, W4HY 4, W4AJK 6, W4HC 8, W4OK 4.

GEORGIA-SOUTH CAROLINA-CUBA-ISLE OF PINES-PORTO RICO-VIRGIN ISLANDS — SCM, J. C. Hagler, Jr., W4SS — W4GT leads the gang in traffic. W4BO has a new MOPA. W4PM had his antenna down for repairs. W4CO reports his XYL is learning the code. Women and college QRM have almost kept W4IJ off the air. W4QZ is on 14-mc. 'phone. W4MN is sporting a new monitor. W4KV is among the leaders in traffic. K4KD was QSO YA6M in Afghanistan on 14 mc. W4DN is located in Atlanta. W4AVM is using a 50-watt TPTG. He reports a new ham, W4GH. W4PD has a new 3750-kc. crystal. W4AY is back on the air after working hard at school. CM2JM has been experimenting with a doublet receiving antenna. W4CE is on air with PP oscillator and PP amplifier. W4KX worked all districts on 3500-kc. 'phone. W4SS is building an MOPA. W4QE has a new receiver. W4AQN has a new transmitter. W4AFQ is working with the Eastern Air Transport Co. W4WB uses 2 '50s in PP TNT. W4AHM, star blind student at Ga. Tech, is operating on 7 mc. Our newest ORS is W4AJ. The Atlanta Radio Club met at the shack of W4MO. A movie, "Induction Voltage Regulators," was shown, and Director Dobbs gave a fine talk. W4MJ worked England and Portugal on 14 mc. CM8YB has a 60-day vacation to take a trip to his home in Los Angeles. W4AAY is on 14, 7, and 3.5 mcs. W4PJ is on 3.5 mc. W4WZ has a new low power crystal rig. W4DV lectured to the Junior College Radio Club on crystals. W4AAY spoke to the Richmond Academy Radio Club on the fundamentals of high-frequency transmission and reception. CM8UF reported total.

Traffic: W4GT 82, W4BO 66, W4PM 54, W4KV 42, K4KD 40, W4MJ 31, W4APX 27, CM8YB 25, W4SS 25, W4AQN 20, W4AAY 17, W4PJ 15, W4WZ 12, W4AOX 12, W4KX 18, W4WN 12, W4MA 12, W4DV 11, W4IR 21, W4APW 10, W4AJH 10, W4NY 10, W4QE 8, W4APK 8, W4AQN 8, W4WB 7, W4WQ 7, W4HN 7, W4AJ 2, W4BW 2, W4AHT 1, W4AAS 1, W4MO 1, CM8UF 4.

WEST GULF DIVISION

OKLAHOMA — SCM, Wm. J. Gentry, W5GF — I wish to thank you all for votes in the SCM election, and I will try to serve you with my best. W5VQ hasn't made any report yet. W5AMC has the high traffic total this month. W5OJ has a new MOPA. W5QL is building a new job for the convention in September. W5BOE thinks the air is dead over his way. W5GF rebuilt his receiver. W5APY is on the air. W5MM is working 'phone now. W5ABO has his 14-mc. 'phone rig going. FB. W5TP reported some fine work done. W5BQW hopes to have his new crystal rig going soon. W5ALD has been trying to get his crystal to perk. W5KZ is a new ham in Okmulgee. W5GA is down on 14 mc. now.

W5ASQ has resigned as RM. W5AIR has moved to Okla. City. W5BPF is using a 75-watter. W5BPM is plugging along. W5AYF wants the RMNITES continued through the summer. W5BRD is a new ham in Shawnee.

Traffic: W5AMC 294, W5OJ 64, W5BOE 26, W5BPM 7, W5ASQ 4, W5ALD 2, W5GF 1.

NEW MEXICO — SCM, Leavenworth Wheeler, Jr., W5AHI — W5AUW leads off with another fine report. W5AJR has recently returned from a visit in Oklahoma. W5AOE has been helping W5AUO at Madrid get started. W5AIE is going in for 'phone in a large way. W5AXV is a new station in Albuquerque and another is W5AFY, East Vaughn. Results of the events at the state track meet in Albuquerque were handled by W5CV (portable of W5AUW), W5AJR and W5BRV, who reported to the student body of Las Vegas High School. W5BQE has been working some DX. W5TV is very QRL with his combined skating rink, soda fountain, luncheonette, and radio shop. W5AHI was off for a couple of weeks.

Traffic: W5AUW 102, W5AHI 71, W5BQE 17.

NORTHERN TEXAS — SCM, Roy Lee Taylor, W5RJ — W5AUL makes the BPL. W5AUN and W5AUJ are new hams in Abilene. W5HY has new location and new filter. W5BII wants some live schedules. W5RJ installed a pair of '72s. W5QU is leaving for school. W5BAM moved this month. W5QY, a new ham in Ft. Worth, has an MOPA. W5RH is rebuilding. W5LY is on with new MOPA. The W.F.A.R.C. of Wichita comes through with a report from W5AYX-W5BJX and W5AVA. W5FT reports for the Big Springs gang. W5FT has a pair of '10s in push-pull. W5LQ has a schedule with W4FT. W5HB-W5QS is having trouble with transmitter. W5BTU is going on 'phone. W5BAD is working in Ft. Worth.

Traffic: W5AUL 160, W5HY 77, W5BII 36, W5RJ 30, W5QU 17, W5BAM 14, W5QY 5, W5AYX 43, W5BJX 28, W5AVA 5.

SOUTHERN TEXAS — SCM, H. C. Sherrod, Jr., W5ZG — From the number of reports and interest manifested by members of this Section all indications are for better organization and a better section report. This is encouraging. Houston: W5TD has been adding a stage to the crystal rig. W5EI is getting out well with a 50-watter. W5BRC is now in Houston. W5AH is on with a 50-watt crystal rig. W5OX occasionally handles the key at W5AH. W5AHW is a new ham in Houston. W5ANW and W5AVU are on 3500 kc. with a good 'phone. W5BKW is handling quite some traffic. W5BHO has not been on much. W5ON is using '10s in a push-pull. Dodge is on intermittently at W5YG. Brumby is threatening to come on with a 3500-kc. 'phone. W5LB sends in a nice report with lots of dope. Galveston: W5AVC is on maneuvers with the third attack group and will visit the north and east during the air corps maneuvers centered at Dayton, Ohio. W5ARR is also on this trip. W5AUX is on with the crystal rig. W5BQJ is also on intermittently. W5BTK is getting out well. The Galveston Amateur Radio Club recently visited the Houston Amateur Radio Club who, in turn, conducted the visitors to KTRH. W5IM has been silent for long time. Corpus Christi: The SCM is indebted to W5AB for the following: Hardly a month goes by that one or more new amateurs apply for license and membership in the Corpus Christi Radio Club. W5AB is the new president. W5ALV is building up a portable for a Gulf fishing trip. W5JJ is on 7000 kc. regularly. W5TO will soon be on 7 mc. W5TO's roommate and partner is W5AAA. W5BRY of Taft is keeping an interesting schedule with XEP at Laredo. W5FH is the new Taft recruit at W5BRY. W5MX is hearing everything and boasts Corpus Christi's best receiver. W5AQK salvaged old W5AB and produced a brand-new P.P. 100-watter. W5BKG, the YL, is quite busy at school. W5AB recently visited W5MT at Kerrville and while there saw stations W5BKZ and W5BSR. W5ANQ, W5BLN, W5AZS, W5FC, W5HY, and W5AB have regular round table QSOs at 4 p.m. every afternoon. San Antonio: W5AUC is located at the Radio Laboratory of the ground school at Brooks field and is manned by two experienced operators, Carl W. Muller (CW) and Charles Kenneth Smith (SM). Bay City: W5ABH-W5KM has a new three-stage transmitter under the call W5KM. W5DS spent his vacation in Bay City. Mallard and Ellis are also working W5ABH. Williams is working as Morse man at nights. Austin: W5CT will be an ORS by the time that this appears in print. W5KA and W5KV have 'phones. W5BB is going to Maine. W5VV QSOed W5BB from Hawaii. W5KA displayed and operated his 'phone at the University Power Show. El Campo: W5ACT has not decided about rebuilding as yet. Bryan: W5AQY, at College Station, is now closed down for the summer, but will return next fall for more traffic and QSOs with the gang. Rosenberg: W5PU is getting out well as usual. The annual banquet and installation of officers of the Wichita Falls Amateur Radio Club was held April 28th. New officers W5BJX, Pres.; W5ARS, Vice-Pres.; (Mrs.) W5UO, Secy.-Treas. The Podunk Hollow Gang from Frederick, Okla., was there in force — seven of 'em: W5OJ, W5BSQ, W5BMB, W5BMU, W5BQZ, and two waiting for licenses.

Traffic: W5EI 60, W5AQY 84, W5CT 12, W5LB 20, W5AUC 315, W5AB 16.

CANADA

Your CGM wishes to thank the members for their excellent response to the request made in this column for information on the 'phone question. Over three hundred responded, which is nearly fifty per cent of the Canadian membership. Traffic is slightly off, but watch the keen competition between Divisions this coming fall. The high frequency end of the 3500-kc. band is the spot for contacts between Canadians on Wednesday nights.

CANADIAN GENERAL MANAGER
ALEX REID, VE2BE

MARITIME DIVISION

NOVA SCOTIA — SCM, A. M. Crowell, VE1DQ — VE1BL is the new Route Manager. All traffic men are asked to get in touch with VE1BL for formation of a Maritime Network. VE1AX is rebuilding his 3500-kc. 'phone. VE1AG is a new low-power man. VE1BC has changed his QRA to Berwick, and puts a nice signal into VE1AG's place. VE1CL is getting out FB with his 'phone. VE1BO is putting a nice 'phone signal into Halifax. VE1CO and VE1DR have been working DX on 14-mc. 'phone. VE1DQ is piling up the foreign cards on his 14-mc. crystal 'phone. VE1AS has "Ford QRM." VE1CO is thinking about rebuilding.

Traffic: VE1AX 19, VE1DQ 11.

ONTARIO DIVISION

ONTARIO — SCM, C. D. Lloyd, VE3CB — The opening of the radio stations of the Ontario Forestry Branch in Northern Ontario has made inroads upon our amateur activities. VE3ET is operating VE9BQ at Sioux Lookout. VE3AQ is at Elk Lake. VE3GT and VE3DD have reported at Sioux Lookout for service in the Hudson District. VE3GT has arranged with VE3CD and VE3AU to handle his schedules while he is in the North country. VE3AD is at Long Beach with his dance orchestra. VE3LM says that VE3TM is getting his new outfit in shape. VE3ET and VE3AQ report several hamfests with fellows around Cochrane. VE3ID reports ham radio activity increasing in Northern Ontario. VE9AL is having trouble getting the "bugs" out of the modulation system of his 14-mc. 'phone. VE3HB is going at his new QRA. VE3GK has added crystal push-pull to the final amplifier. VE3CE and VE3CD are busy plugging at studies. First reports are to hand from VE3QB, VE3GL and VE3GB. VE3BT and VE3DC are the only ones on the air at Hamilton at present. VE3XK has moved to Montreal, and is working under the call VE2DX. VE3CA is keeping a number of schedules. VE3CB is on 7-mc. band.

Traffic: VE3GT 335, VE3CD 110, VE3AD 41, VE 9AL 36, VE3GK 30, VE3QB 6, VE3HB 5, VE3LM 3, VE3GB 2, VE3GL 1, VE3ID 1, VE3CE 3.

QUEBEC DIVISION

QUEBEC — SCM, Alphy Blais, VE2AC — VE2CQ is proud of his push-pull transmitter. VE2AA is getting out very well. VE2CA carries off the prize for Canada for the British Empire Radio Week tests of the R.S.G.B.

(*Continued on page 76*)

• CALLS HEARD •

W2AWU, John H. Gullans, 501 West Seventh St., Plainfield, N. J.

7000-kc. band

w6amo w6aeh w6avu w6anq w6aoj w6axm w6aeo w6aiu w6aoa w6alt w6amm w6aor w6aax w6acp w6ayl w6ahn w6ads w6azp w6azn w6aun w6apd w6bnc w6bqp w6boq w6bke w6bac w6buu w6bvs w6bpo w6byb w6bmo w6biz w6bht w6btm w6brv w6bqh w6bck w6bcd w6bpw w6bas w6bqk w6bhe w6cqk w6cgp w6cbp w6cfe w6cte w6cya w6cvv w6cje w6ccx w6cuj w6cxp w6cpp w6cma w6cvz w6caf w6cox w6der w6dip w6dru w6dmj w6drh w6dxl w6dgu w6dug w6dyn w6dza w6dak w6dek w6dwi w6efv w6ezq w6eif w6efr w6eko w6etn w6epo w6ezp w6egk w6ebg w6erb w6eza w6egm w6exq w6ebd w6ekn w6evn w6enh w6evy w6eup w6exb w6equ w6eju w6ej w6fff w6ffp w6fbh w6fci w6feb w6ff w6ft w6fdk w6xam w6zzv w6jm w6iu w6qt w6pb w6li w6pn w6ov w6ny w6oi w6tm w6tc w6sp w6sq w6uk w6vl w6sb w6wo w6uc w6vh w6vq w6zs w6yx w6zv w7afl w7aho w7awl w7asg w7ajn w7afp w7asd w7azk w7afs w7arw w7aax w7acq w7asl w7ank w7akd w7apr w7bcp w7ww w7fd w7vy w7fu w7mx w7lb w7qi w7ew w7hp w7mh vk2ow vkakj vkahm vkanb vk3bh vk3ka vk3jw vk3tm vk3pr vk3ju vk3ei vk3rs vk3hk vk3rw vk4ju vk5kw vk5xk vk5it vk5mp vk7ch ve4ag ve4bv ve4ed ve5ag k4ug k6aja k6agi k6cog k6fcx k6dmm k6ccs k6erh k6ed z1lar zl2ab zlagm zl2cu zl3rn zl3lb nn1nic nn1sc nn7xj hh7c lu1cs x1ax xa8a dz5 pxr

PA0QQ, C. A. Gehrels, Eindhoven, Netherlands

3500-kc. band

w1aat w1aar w1adu w1aif w1afb w1avp w1ack w1azn w1axv w1bav w1bac w1bbz w1bnd w1bdi w1bop w1bfo w1bhm w1bu w1btj w1cdc w1cjd w1cjz w1cru w1eg w1fl w1fn w1gs w1hli w1mk w1mx w1sz w1pi w1wv w1zb w1ze w1zy w2ait w2akq w2awl w2avr w2azt w2bev w2bme w2bzm w2bzr w2cep w2cef w2etv w2cuq w2cwk w2csc w2dv w2gjw w2sc w2zc w3aqr w3asj w3awu w3aln w3asw w3bex w3bwt w3cxm w3gs w3gx w3hc w3oz w3pl w3tr w3uv w3wx w3zf w4mo w4lm w4rs w8bas w8brc w8bug w8cig w8cja w8def w8dra w8pk w8uv w8vd w9dgz w1al vc1ax vc1az vc3cz vc3zz zl2cj cmb6

R. P. Haviland, Warrenton, Md.

1750-kc. phone band

w4atu w5aki w5al w9app w9aqy w9arq w9bas w9bsi w9bsp w9cap w9car w9cas w9cdm w9cef w9cgg w9cy w9di w9dsp w9dsr w9dqc w9ewc w9exk w9fhw w9ua w9?

3500-kc. phone band

w3ex w4muo w4tm w4uu w4ze w5pt w5vlm w5zt w8ajh w8arw w8aw w8ayt w8bht w8byr w8cxw w8dyt w8fke w8rl w8ws w8zrf w9aai w9abc w9bct w9bde w9bht w9cju w9clt w9cwi w9dcu w9dhx w9dhm w9dmx w9dtt w9duz w9dwi w9eat w9eay w9ecq w9eem w9ehd w9em w9eqm w9esl w9etd w9fax w9fei w9foc w9fq w9fvz w9uy

14,000-kc. phone band

w1axa w1bjd w1rd w1zr w2aag w2cn w2ek w2km w2qs w3dy w3ss w3zx w4ai

W1BFT, C. B. Evans, Concord, N. H.

(During International Tests)

ce3ch ce3cr cm2ay cm2cf cm2pa cm2sh cm1by cm1fm cm8by cm8uf cm8yb ct1aa ct1bx daiv d4abg d4adf d4rhr d4wao d4uak d4uan ear10 ear16 ear18 ear96 ear116 ear136 ear185 earmc ei8b f3mta f3smi f8cs f8dt f8ej f8eq f8ex f8fg f8fo f8fq f8fz f8jl f8joz f8kz f8lgb f8lw f8pm f8pw f8rj f8ru f8ewa f8tv f8uk f8xd f8xz fm8mst g2ao g2ay g2by g2by g2cj g2dh g2jf g2lz g2nh g2nu g2mi g2oi g2ol g2op g2pa g2vq g5bj g5bq g5by g5bz g5is g5la g5ml g5qv g5vm g5wq g5qf g5yg g5yk g6bd g6br g6dh g6gs g6hp g6jg g6lk g6nf g6om g6qp g6pa g6rg g6rb g6vp g6wn g6wt g6wy g6xn gi5nj hc1fg hc2fg k4bpf k4kd k4rj k4ug k6cmc k7mn ka1jm lu1ba lu1dt lu2ca lu3fa lu4dq lu8djc lu9dt oa4z oh7nb on4aa om4dj on4fe on4fp on4fq on4gn on4ja on4jb on4jc on4ro on4uu on4wk pa0fb pa0gg pa0mm pa0ps pa0qf pa0qq py1aa py1cm py1cr py2az py2bj py2bk py7aa sm5tc sp1kx ti2fg ti2cb ti3xa ts4sax v1yb vkdy vk2lx vk2ns vk2mh vk2pp vk3bq vk3hk vk3hl vk3jk vk3ka vk3ml vk3pp ck3rj vk3wl vk3zx vk5bo vk5gr vk5it vk5mf vk5wr vk5xk vk4rj vk7ch vk7jk vn2bg vo8ae vo8aw vo8j vo8mc vo8z vs6ah zl4 x1a x1aa x1ax x1b z1lar zl2ac zl2aj zl2bl zl2gn z12xi z13ai zl3ao zl3as zl4ao

W6DHS, Frank Clark, 2948 Telegraph Ave., Oakland, Calif.

(February)

w1af w1bix w1cpi w2abe w2alp w2ano w2boz w2byt w2ccv w2dk w2jd w2vy w3ajh w3asg w3bfh w3bhy w3bm w3bw w4abt w4acv w4agi w4aig w4akg w4dc w4fd w4fr w4ft w4ei w4gq w4jw w4jx w4mm w4nl w4sd w4sg w4tk w4tu w5aaw w5abb w5abk w5afg w5afl w5aie w5aja w5ajr w5ald w5anq w5aoe w5apm w5aqy w5ark w5asp w5atf w5auw w5axp w5ay w5bah w5bam w5bbq w5bbx w5bcb w5bcx w5bjx w5bls w5bno w5bob w5bol w5bpf w5bq w5bqt w5bqz w5brr w5btc w5btu w5cl w5fw w5gc w5kt w5lb w5lq w5ms w5rg w5rv w5ph w5un w5uo w5vq w5wf w5yg w5yw w8aav w8alo w8amb w8ano w8bak w8bcj w8bih w8bkp w8bny w8brh w8bwc w8byz w8ckf w8cln w8ddk w8ddq w8dep w8dgp w8dqk w8gz w8kc w8mk w8sy w9aab w9aad w9adn w9aef w9afj w9amv w9arn w9asd w9asq w9auj w9avw w9azv w9bab w9bb w9bbz w9bcl w9bkz w9bmt w9bnk w9bpb w9bpf w9bpm w9brr w9bsv w9buv w9bvh w9bxk w9cbj w9cfn w9cgc w9cne w9cno w9cos w9cpy w9cu w9cwx w9czw w9dbk w9dcy w9dhj w9doc w9dqr w9dqv w9dti w9dto w9dwa w9dyx w9eaw w9efc w9egu w9ehi w9eig w9eip w9elg w9eme w9erv w9exv w9fbc w9fdw w9ffk w9fgb w9fhu w9fhy w9fjd w9fpy w9fqk w9fyk w9gaw w9gbj w9gcx w9ges w9ggu w9ghi w9gky w9jl w9lt w9qa w9qf w9rp w9uz w9vq ve3rf ve4cb ve4dj ve4ga ve4gf ve4hf ve5cr ve5dn ve5dp ve5dv ve5dx k6aja k6alm k6boe k6ccs k6cdd k6cib k6crw k6dmm k6ed k6erh k6etf k7apw ka1ce ka1dj ka1fg ka1hr ka1jr ka1sl ka9pb f3ocb rx4x x9a x5z hh7c hk1aa om1tb w1v wsq he1fg vk2jf vk2lx vk2mh vk2ns vk3bm vk3bz vk3ka vk3ml vk3td vk3wl vk4rw vk5hg vk5mb vk5wr vk5xk zl1aa zl1bb zl2gp zl3cm zl3cv zl4bl

W8AOR, John E. Lambert, 9 River St., Champlain, N. Y.

14,000-kc. band

w4sv w4hc w4afc w4ru w5ql w5ha w5qu w5bor w5bsc w5bee w5rw w6aqj w6bip w6eqb w6byy w6eou w6cbp w6ejc w6dhp w6ezk w6id w6sz w6ers w6bhz w6edt w6qc w7awl w7afp w7ny w9eoz w9eql w9fli w9afd w9cuy w9ghh w9cpt w9dex w9fyz w9bbf (w9dtp fone fb) oa4z cm5cx f8uk g6xn g6wl vzx4x hvj

7000-kc. band

w4dp w4hc w4abv w4gq w5rw w5rr w5td w5ajj w5lb w5ga w5md w5btu w5aul w5abb w5boc w6egv w6bfe

(*Continued on page 78*)

• I. A. R. U. NEWS •

Devoted to the interests and activities of the

INTERNATIONAL AMATEUR RADIO UNION

President: H. P. MAXIM *Vice-President:* C. H. STEWART *Secretary:* K. B. WARNER

Headquarters Society:

THE AMERICAN RADIO RELAY LEAGUE, West Hartford, Conn.

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Asociacion E. A. R.
Associazione Radiotecnica Italiana
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Reseau Emetteurs Français
South African Radio Relay League
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Union Schweiz Kurzwellen Amateure
Wireless Institute of Australia
Wireless Society of Ireland

Conducted by Clinton B. DeSoto

HOW many of you fellows in parts of the world other than the North American continent are making full use of the special Standard Frequency System schedules run for the convenience of international listeners? If all of the 30,000 amateurs scattered over the globe were to make use of this million dollar service (as evaluated in May *QST*) its value would soon rise to a million and a half! A decidedly worth-while consideration, particularly since these early Saturday morning transmissions so correlate the regular schedules that it should be possible to receive standard frequency transmissions in every part of the world.

Many are doing it. The S. F. System receives reports frequently from the Antipodes, all over Europe and Africa, and even from Asia. But it is, nevertheless, hard to secure general adoption of the service. We read in a newspaper last night that it took an hour's constant harangue to a huge street crowd in one of the large cities to dispose of five perfectly good $5 gold pieces at the cut rate of two dollars and a half each. Don't be like that! Turn to the Standard Frequency News and Schedules section of this issue of *QST* and select the next suitable schedule. You can quite readily calibrate your frequency meter to an accuracy of within .01%, and have definite assurance of just where all those kilocycles are located.

At the End of Five Years . . . . . the WAC Club boasts a membership of 566 amateur stations with which has been accomplished two-way communication with other amateur stations in each of the six recognized continental areas of the world. This means about 550 different amateurs, since a small and honored group of four have acquired the radiotelephone class of membership as well as that for c.w., and an occasional few have duplicated the feat by working all the continents from more than one station.

They are scattered all over the world, these prize stations of international amateur radio communication, and are to be found in 47 countries. The membership of each country is listed in the table below, with a further classification for the change in the sponsorship of the WAC Club to the I.A.R.U. in January, 1930. The first column of figures indicates the total number of members accepted from that time until April 15th of this year. The second column shows those granted the old A.R.R.L. WAC certificates before that time, extending back to April 13, 1926, when the Club was founded.

MEMBERSHIP OF THE WAC CLUB BY COUNTRIES

Country	*I.A.R.U.*	*A.R.R.L.*	*Total*
Argentina		2	2
Australia	22	22	44
Austria	4	1	5
Belgium	16	6	22
Bermuda	1		1
Brazil	4	8	12
Canada	2	3	5
Ceylon		2	2
Chile	1	6	7
China	2	6	8
Cuba	1		1
Czechoslovakia	9	2	11
Denmark		3	3
Dutch East Indies	2		2
France	4	7	11
Germany	13	3	16
Great Britain (except Ireland)	26	44	70
Hawaii		4	4

Hong Kong	3		3
Hungary	4		4
India		5	5
Irish Free State		2	2
Italy		3	3
Jamaica		1	1
Japan		1	1
Jugo-Slavia		1	1
Kenya Colony	1		1
Madeira		1	1
Malaya		1	1
Netherlands	5	6	11
Newfoundland	1		1
New Zealand	10	10	20
North Ireland	1	3	4
Northern Rhodesia	1	1	2
Norway	1	1	2
Peru	3	1	4
Philippine Islands	2	5	7
Poland	2	2	4
Porto Rico	1	1	2
Portugal		7	7
South Africa	5	22	27
Southern Rhodesia	1	1	2
Spain	7	2	9
Sweden	2	3	5
Switzerland	1		1
Uruguay		5	5
United States			
1st District	2	27	30
2nd "	9	19	28
3rd "	4	8	12
4th "	1	7	8
5th "		17	17
6th "	14	56	70
7th "	2	11	13
8th "	5	4	9
9th "	3	14	17
	199	367	566

Lists of WAC Club members by names, calls, and years will be found in this department of past issues of *QST*.

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Some time ago we received a postal card from Frank Lucas of WSCRA, in Canonsburg, Pa., on which he said, in part: ". . . so much talk about that 11-year sun-spot cycle . . . all indications here show conditions reversing only for the Southern Hemisphere. South Africa and South America come through better a.m.'s than in afternoon or evening, but not many stations on the air. Don't let this hold us apart fellows! . . ."

That observation was mighty interesting, you may be sure, so an effort was made to correlate the data giving rise to that thought into more detailed form. Among the various general conclusions reached, it was recalled that back until 1927, or through the period of sun-spot maxima, from a particular locality in the Antipodes such as Australia or New Zealand 14 mc. was capable of carrying steady signals through from 1 a.m. to 5 a.m. WSCRA, for example, states that he has worked as many as eighteen during one morning, in mere general operating, with no contest or any stimulation of that sort going on. And much the same was true with the South American countries.

But now? It's entirely different. Signals generally are weaker, and instead of appearing at one general time, growing stronger until a peak was reached sometime during early morning and then fading away, two or more distinctly different periods appear during which these signals are present — usually at the beginning and end of the accustomed 1928 time. Most interesting of the results which lead to this generalization is the fact that during late March and April South Africans have once more put in an appearance at WSCRA. In fact, stations have been worked all the way from Egypt to Capetown, including Kenya, Sudan, and Rhodesia. Eurasia, too, in general blasts in with much better strength and consistency than hitherto.

MRS. E. L. HUTCHINGS, VK3HM, "BRYN AVON," CALLAWADDA, VICTORIA, AUSTRALIA

WAC, WBE, and what's more, mother of VK3HL, and grandmother of "Evelyn Margaret," VK3HL's new junior op. "As keen as mustard about amateur radio," has been said of her. Her station is crystal-controlled, and with her son, Alan T. Hutchings of 3HL, she engages in quite elaborate experimental work.

In order to portray these results with the fullest possible clarity, Mr. Lucas has prepared a rather novel sort of DX Time Table, in which he takes us for a full day's visit at his station WSCRA. The scene is that of the operating shack; the time, bright and early some Sunday morning about 6 a.m.; the characters, he and you and I.

"No doubt we will hear VK's and ZL's coming through. We'll raise and work a few of them, meanwhile keeping a sharp lookout for the elusive Africans. Around seven we raise one of them, then another, and thus occupy ourselves until 7:30. From then until 9 a.m. South America will come through, after which Europeans will be heard weakly, growing stronger until twelve o'clock. During our noon hour they are heard calling VK, ZL, PK, J, XU, AC, AU, YI and a lot of Asiatic countries.

"It is now — from twelve to 1:30 p.m. — that we want to tune very carefully, as this is the time when Asian stations fade into the East coast of the U. S. A. During the rest of the afternoon we can hear fifteen or twenty Europeans. At about 4:30 or 5:00 North Africans come in for a while, reaching a high peak of signal strength and then fading out again. Europeans still remain R5 to 9, but they soon start fading also, and then South America comes to bat.

"At about 8:30 and 9:00 W6 and W7 grow strongest, and if we are lucky we'll hear some K7 and K6. After this we get another chance at Japan, China, Siberia and the other Asiatic countries along the Pacific. About 10:30 p.m.

(Continued on page 84)

• CORRESPONDENCE •

The Publishers of QST assume no responsibility for statements made herein by correspondents.

Operating Practices

725 East Hill St., Long Beach, Calif.

Editor, *QST:*

I have just finished perusal of K. B. W.'s editorial in the May issue of *QST* and believe me, he has hit the nail squarely on the head in regard to a variety of "ham" practices. I use the word ham in a double sense.

I have just recently got back into the amateur game after a number of years at sea and at various coast stations since 1922 and I find conditions rather changed, to put it mildly.

K. B. W.'s statement regarding the use of "OB" and, I might add, "OT" has in me an ardent backer. "OM" has been and always will be the term of friendship used by radio men and other terms such as "OB", "OT", etc., are but childish attempts to be different and perhaps funny, and are extremely griping to anyone who has been in the game long enough to really get into the spirit of it. As a matter of strict fact even the use of "OM" on commercial waves is frowned upon as being slightly "liddish" but it can get by, whereas anyone using "OB" or "OT" would be looked upon as a boot of the direst sort. I merely cite this commercial example as an instance of the attitude radio men assume toward the use of these terms.

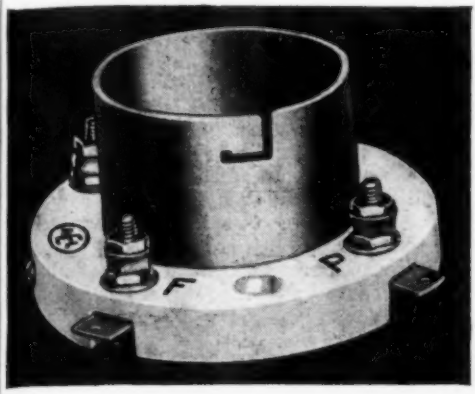
While on the subject of terms, the use and misuse of "73" is another touchy subject to an old timer. "73" is in itself all that anyone could require for a term to signify "best regards" and the addition of "very", "best" and the suffix "s" is an indication that the user is ignorant of the meaning of the term. Let's cut out the superfluity in our use of "73."

The next in line are the bug "senders" who persist in screwing the dots on a rickety, haywire bug up to around 40 or 45 w.p.m. and then sending at a rate of probably 15 to 20 w.p.m. at most by simply murdering the good old Continental Morse, spacing dots and dashes, holding dashes to unbelievable lengths and repeating every other word two or three times due to bulling them with the bug.

It would be a revelation to some of these would-be high speed artists to listen to some of our shore stations from 650 to 750 meters handle traffic with ships. Half of our coast stations rarely use a bug and those that do never have it set to more than 20 or 25 w.p.m., hardly faster than hand sending, although we have some of the best operators in the world at our shore stations and at sea. Handle traffic? I should say!! When you can bat out 40 and more marine messages per hour you are handling traffic, and our trans-atlantic and trans-Pacific seagoing friends do it for hours at a stretch when traffic is heavy. No superspeed bugs here. Just nice, readable, clean bug or hand sending that carries through QRM, QRN, and sundry other annoyances. Yes indeed, a couple of hours on marine waves would do the high speed (?) boys a lot of good besides the snappy operating procedure they would observe and mayhap, absorb. There are no "R R OK's" up there without the operator having gotten the message *en toto* without the shadow of a doubt. If he ever should do so he would receive a "package" of correspondence that would take a wheelbarrow to haul around — and who knows what else. After all, radio is like anything else in that it is a question of amassing experience, and why not profit by others?

Rotten signals are very much in evidence as yet in the 7- and 14-mc. bands despite much propaganda on the part of *QST* and public-spirited amateurs to clean them up. I have observed that most of the rotten sigs come from fellows who are trying to slap their transmitters with everything from the baby's rattle to the kitchen sink in the hope they will raise that "R" report a point. After all, which is more important, a loud signal or readability? What profit it a ham to smear a section of the band with a lot of mush if his signals are practically unreadable and cause all amateurs within 10 or 15 kilocycles either side to gnash their teeth and heartily cuss the offender? Nothing is prettier to listen to or easier to copy than a pure or near d.c. note with steady frequency, no matter how weak. It is so easy to obtain it — and without the outlay of more than a moderate amount of cash. High capacity in the plate tank is perhaps the most important item and easiest to obtain. It reduces the power output slightly due to increased tank current but what of it? Readability!! That's the important point. Again, we find high rectifier voltages and no filter. Buy lower rating condensers and reduce the plate voltage if the cash is low. Any ham radio supply house sells 500- or 600-volt filter condensers so cheap it is almost a give-way. The power input will have to be reduced slightly but again what of it? Readability!! That's the thing. An excellent choke for

Power Tube Sockets



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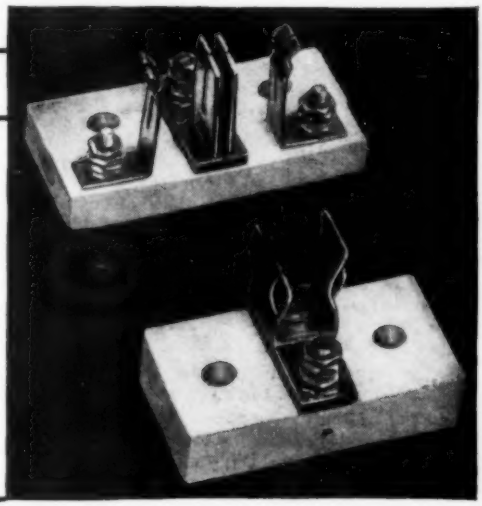

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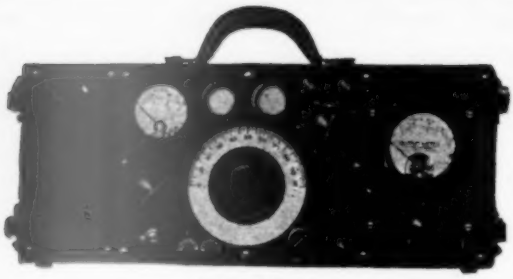

(Model 590)

WESTON *Announces the* COMPLETE OSCILLATOR

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Features of Model 590

GRID DIP MILLIAMMETER—mounted on Oscillator panel. Also serves as filament and plate voltmeter. Definitely indicates that Oscillator is operating. Enables each R. F. stage to be individually tested. Determines resonance point of any coil and condenser circuit within Oscillator range.

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a low-power transmitter can be made out of several Ford coil secondaries placed in parallel and they will pass enough current to prevent chirp, providing you don't try to make a 250-watter out of a 210, and oh how cheap!! Again we have increased readability.

As a parting shot, let's change our attitude toward traffic handling somewhat. Time after time have I had a message or two for some point and raised a station in the same locality who gave me a good report but when I started to send a message either quit me without explanation or came back with the old "sri ND CUL 73 SK" gag which is too obvious to be good any longer. A new gag would at least lend some element of doubt to it. I am taking for granted that a goodly percentage of the present amateurs expect to continue in radio in some form or other, so why not start now by being conscientious about this message business, which after all is a great part of the game. Personally, I wouldn't care to have the type of fellow who does those things handle my traffic anyway, as he would probably "bull" it, but the percentage is far too great for the good of the game.

With this lengthy discourse off my chest, I will sign off.

— *J. H. Brown, W6VH-KFOX, ex-KFS-KOK*

To Be or Not To Be—That Is THE Question

Fort Omaha, Neb.

Editor, *QST:*

The entire future of the radio amateur depends upon his present policy. That his very existence is being questioned is no secret, and at such a time it behooves us to forget our petty personal grievances and pull together. Rather than worry about whether we should be phone hounds or brass pounders, let's worry about being *either*.

There's one thing certain, and history has proved it:—"United, we stand; divided, we fall." In order to survive, in modern existence, there must be organization. The success of any organization depends upon the loyalty, zeal and efforts of the members of the organization.

Stephen Decatur once said, "Our country! In her intercourse with foreign nations, may she always be in the right, but our country, right or wrong." Without such loyalty, the United States would not exist to day. Without such loyalty the A.R.R.L. will not survive, and with its fall will fall also your phone or c.w. set, high or low powered. It will be more than a "high power holiday"; it will be a radio amateur holiday, and it will be a long, long holiday.

All of this would appear to question the loyalty of A.R.R.L. members. It does, and does so knowingly. There are some in our A.R.R.L. who can't seem to get beyond petty criticism and visualize the size of the job and how well it is done. There are some who are too ignorant to realize the service being done for them by others.

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Q-7

There are some who do not realize that if it were not for the A.R.R.L. there wouldn't be any amateur radio to-day. To some critics, may I ask what they personally have ever done for the A.R.R.L., that they are so loudly demanding their rights, privileges, etc.?

This is not directed at the majority of A.R.R.L. members, but to those few who are trying to spread this stuff around. These are the ones who are doing most to "sell us out." With internal dissension, petty criticism and civil war, we can be headed in only one direction. The A.R.R.L. is a self-governing democratic organization. Your directors are doing what the majority want them to do. If it does not meet the expectations of the minority, don't blame Headquarters. Get busy, if you're sure you're right, and sell your ideas to the rest of the voters. When you have the majority convinced, your director and Headquarters will back your way of doing things. *Until* that time, be loyal, be fair, and don't criticize those who are responsible for your very existence.

Pull together or we'll pull apart. No organization can please *all* its members. If you are a determined "bolshevik" and *can't* have your way, and won't coöperate with the majority, then be sport enough to get out and let the rest of us try to get along without you.

Your rights can best be obtained by your organization officials. In touch with all legal details and knowing from many years' experience what is best and what is possible, if our Headquarters representatives can't do what is best, then who is better fitted for the job?

Think, before hopping onto a band wagon that is out to wreck your organization. Be loyal, and support your directors and your A.R.R.L. And, might I add in closing, miss no opportunities to affiliate with those who can help you. The best friends you have are the Army and the Navy.

— Lt. H. P. Roberts, W9BNT,
Army Liaison Officer, 7th C. A. Hdqrs.

How to Get DX With a 210

615 Ambler Ave., Rockymount, N. C.

Editor, *QST:*

I wonder if you have room for a few words from a young squirt. That's what I am, for I have only been in the game for a little over a year.

Please understand in the beginning that it is not about the high-power holiday, as that subject has been worn to a frazzle and the frazzle bursted. I say let's table it forever and try to forget it and forgive our brother who started it, for I am sure he meant well.

This high-power argument has brought a problem to my mind, which is how can I get DX with a Type '10 tube. For all poisons there is an antidote, if we can find it. So it is with all problems — there is a solution if we can find it.

After working and studying overtime I have found the solution. It works, and I would like to pass it on to the rest of the gang that they too may get the most out of their Type '10 tubes.

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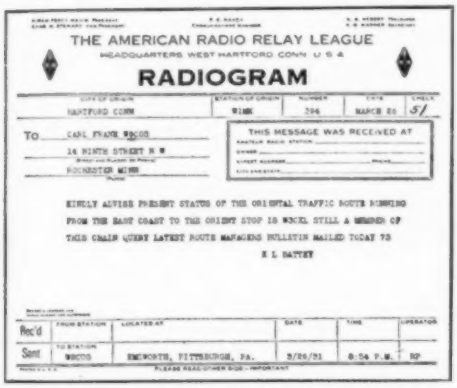

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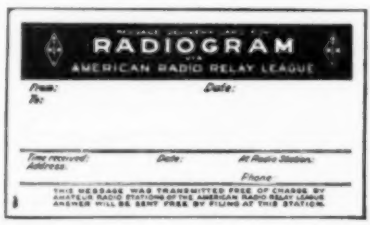

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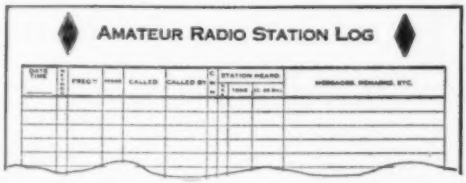

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Double: Each section 30 H., 200 MA. **$4.65**
RCA DOUBLE. Each section 30 H., 125 MA. Metal-cased. **$1.85**
G.E. 5 H., 1000 MA. 25 Ohms. Metal cased. 11 lbs. **$2.65**
Mounted RF Chokes. 85 Millihenry **35c**

JULY SUPER-SPECIALS

Only one to a customer *Good this month only*
FEDERAL or ERLA 3½: 1 Audio Transformers. **85c**
TOBE 10¼ mfd., 600 volt Block. Metal case (no cover) . . **45c**
Live Rubber shock absorbing UX sockets. Three for . . . **10c**

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ZENITH. Gives 7½ Volt CT. and 750 Volts for half-wave rectifier. P-B for 210 transmitters. 200 Watt. 8½ lbs. . . . **$2.35**
HEAVY DUTY. Gives 750 CT., 5, 2½, 2½, and 1½ Volts. A husky job for 245 P-P transmitter or AC set. Shielded . . **$3.50**
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RCA VICTOR. 150 Watt. Supplies 650 volts center-tapped 2½ CT, 2½, 1½, 1½, and 5 CT. Our Price **$2.15**
ZENITH ZE-7 Power Supply. Delivers 800 Volts of rectified AC all ready for filtering and filament for 210, 272's and 226's. In metal cabinet. Build your AC set or amplifier around this superior unit! Original cartons. Uses 281 tube. Only **$9.25**

PUSH-PULL POWER AMPLIFIER KITS

Complete parts for a QUALITY Amplifier including power supply. First stage 227. Will also supply A B and C to receiver. For UX-245's — **$10.75**. For UX-250's — **$14.75**.
Complete high-grade parts for 245 P-P Transmitter (à la Nov. *QST*) — **$16.95**. Power Supply alone **$8.95**

ROYAL PORCELAIN STAND-OFF INSULATORS

Neatest and best-designed. Rich brown or sparkling white. Similar to G.R. — **11c** each. Per dozen **$1.10**
ROYAL Microphone Transformers. A quality transformer carefully designed to assure faithful reproduction of voice and music for all purposes. Primary impedance of 100 or 200 ohms. For single button mikes — **$2.25**. Double button **$3.85**
BRISTOL MICROPHONE TRANSFORMERS. Made by the Bristol Talking Picture Co. For double and single button mikes. This is a *real* mike transformer. (Not an old telephone induction coil). Every one perfect. Our Special Price . . **$1.95**
RCA Push-Pull Input-Output transformer. Metal-cased . . **$1.65**

PARCON TRANSMITTING FILTER CONDENSERS

Metal-cased with stand-off insulators. Fully guaranteed!

Working Voltage	1 Mfd.	2 Mfd.	4 Mfd.
1000 Volts DC	$1.20	$1.85	$3.10
1500 Volts DC	1.85	3.00	5.60
2000 Volts DC	2.85	5.25	8.35

First time at these new low prices. *Order Now!*
RCA metal-cased 1 Mfd., 1000-volt condensers **65c**
POLYMET 8 Mfd., Electrolytic condensers **98c**
FARADON 2 Mfd., 1100-volt working. Cased **$1.35**
TUNGSOL metal-cased, 2, 2, and 2 Mfd., 1250-volt. **$3.95**
1 Mfd. 1500 V. and 2 Mfd., 1000-volt. **$2.95**
DUBILIER .002 Mfd., 6000-volt WORKING. Mica **$1.75**
AEROVOX 2500 V. (test) .002 — **90c**. .001, .005, .00025, .0001 — **75c**. 5000 Volt: .002, .001, .005 — **$1.00**. .00025, .0001 — **94c**

WIRE WOUND TRANSMITTING GRID LEAKS

WARD-LEONARD 10,000 Ohm 6" long — **65c**. CT 4" **45c**
RCA 5000 Ohm. 50 W. — **39c**. Electrad 50,000, 25 Watt . . **82c**
ELECTRAD 50,000 Ohm, 45 MA Bleeder. Mounted **$3.20**
CARDWELL 3000 volt transmitting .00044 or .00033 — **$6.24**
Lowest prices on all other Cardwell Condensers.
Enameled Aerial Wire. No. 12 — **70c** per 100 feet. No. 14 . . **50c**
H & H Single pole, triple throw snap switches. 500 Watt . . . **35c**
DeJur 2 Amp Rheostats — **22c**. Bakelite 4" Dials **20c**

ROYAL DUSTPROOF PLUG-IN CRYSTAL HOLDERS

Very neat holder. G.R. plugs. Two for **$4.75**. Each **$2.45**
Imported French Headphone Sets. 4000 ohms **$1.25**
Highest Quality TUBES. *Free 15-day replacement.* UX-281, **$1.45**. 210, 250 — **$1.95**. 280, 245, 171-A, 112-A, 227, 226 . . . . . **65c**
RCA No. 80 Super-het intermediate transformers **25c**
Centralab 25,000 or 50,000 Ohm Potentiometers **45c**

FREE Send NOW for our new BARGAIN BULLETIN

Because of the high cost of handling, we cannot accept orders under $2.50. Deposit required

HARRISON RADIO CO.

189 Franklin Street Dept. T New York City

The first time I tried to I got two VK's; the next time I got a K7. The last test was on the morning of May 2nd and I worked all districts in six hours, taking fifteen minutes recess four times. Do the three tests prove its worth? It is very simple—anyone can do it. Here is the trick:

Get up early in the morning and take a nickel from your pocket. If you don't find one there, borrow one — or better still snitch one from the O.W. Now stand flat-footed; toss it up and if it falls heads-up DX is yours. But if it falls tails-up, go back to bed, for DX is as high-low to you as ice cream is to a turkey-buzzard.

— *M. J. Duke, W4VB*

A Curious Coincidence?

132 Montrose St., Winnipeg, Canada

Editor, *QST:*

Here's an item that may be of some interest to *QST* readers.

A few evenings ago I happened to be listening to a lecturer on the air from the local b.c. station discussing the meteorological phenomena of this past winter. During his talk he told this story:

On the morning of Feb. 25th two physicists at the Smithsonian Institute while walking around the building happened to notice what appeared to be a very large image of the sun on the floor. On investigating, they found that light was coming through a small crevice in the roof, and that the image was being formed in the same way that a pinhole camera forms an image, the height of the roof from the floor making the image very large.

By an inspection of the image they found that at least 40 well-defined sun spots could be observed with the naked eye, this being a condition never before approached.

Out of curiosity, I looked up my log for the day in question, and was surprised to find that at 1:15 a.m. on that one particular morning I have recorded hearing the first ZL of the year on 20 meters.

Practically every night in the winter it has been my habit to listen for a few minutes on "20" at about midnight, so that I know this was out of the ordinary. Also, although I listened practically every night from then on at the same time, it was not until March 28th that I again heard a ZL on 20 meters.

This may be only a coincidence and may have no significance whatever, but possibly other listeners may have had a similar experience on that day. I would be greatly interested in hearing of any corroboration.

— *R. A. Chipman, VE4IC*

Hi!

559 Van Cortlandt Park Ave., Yonkers, N. Y.

Dear OM (*not* OB):

I know you will take time off to struggle through this one because it contains NO BRICKS.

Though sort of an old timer (busting ether with spark coils, etc., in 1914), I seldom write, but

Special Announcement to Amateurs

A New Sargent Short Wave Set, designed especially for peak efficiency on Amateur Waves, will be ready June 15th.

Super-Het, Positive "One-Spot" Tuning, 10-kc selectivity, Two Intermediates, Power Pentode, Band Spreaders. Everything you need to get those weak DX Stations.

Use the coupon below — send it in at once. Complete details released June 15th.

The Sargent Short Wave Line of Converters, Amateur Tuners and All-Wave Receivers gives *Complete Coverage* of the Short Wave Field.

Jobbers:

The Sargent Short Wave Line is sold through regular trade channels and is handled by better class jobbers. Wire or write at once regarding distribution in your territory. This is a high quality line marketed under a well-known trade name. It offers an opportunity for the right distributors.

Representatives:

Some territory is still open. If you are in position to do justice to a first class Short Wave line communicate with us at once.

A.R.R.L. RADIOGRAMS RECEIVE SPECIAL ATTENTION

Cable Address "RADIOSTRUX"

RADIO CONSTRUCTORS COMPANY
3714 San Pablo Avenue, Oakland, California

I am interested in your Short Wave Models, particularly the

....CONVERTERS ....ALL-WAVE RECEIVERS ....SPECIAL AMATEUR RECEIVERS

Please send me complete details:

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(NOTE OUR NEW ADDRESS) *Address* .....

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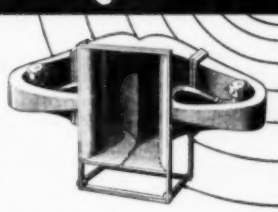
A NEW DEPENDABILITY IN SOUND EQUIPMENT

Fox units not only command attention for their output volume and tone value — they offer definite exclusive coil and diaphragm features that insure continuous service.

The Fox Electro-Dynamic Unit and the Fox Rams Horn is a combination that out-demonstrates anything on the market.



Improve your present equipment with a FOX Unit

FOX ENGINEERING CO.

386–390 Dorr St., Toledo, Ohio, U. S. A.

Complete sound engineering service. Estimates free for special work

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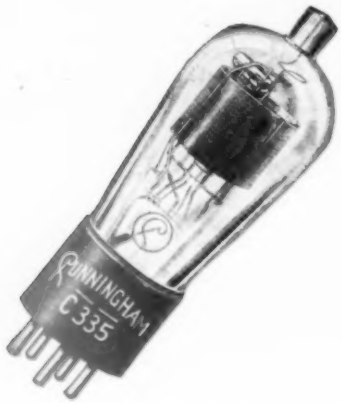
RADIO TUBES

RADIO'S MOTIVE POWER
SINCE 1915



C-335

Super-Control
Screen Grid
R.F. Amplifier

Operating Voltages

Ef — 2.5 Volts AC/DC
Eb — 250 Volts
Ec — -3 Volts minimum
Ed — 90 Volts maximum

C-335 is a very effective tube for reducing cross-modulation and modulation-distortion over the normal range of received signals. Its design permits easy control of a large range of signal voltages without the use of local-distance switches or antenna potentiometers.

The mutual conductance of this tube is 1050 when operated with a grid bias of —3 volts and 15 with a —40 volt grid bias at the above plate and screen voltages. This large range of mutual conductance makes it possible to give, with several control stages, satisfactory volume control operation under normal signal conditions.

E. T. CUNNINGHAM, INC.

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your editorial in the May issue sure fills the bill — couldn't have been better had I written it myself. Hi. You sure caused the gong to jingle.

To mention that I am R.C.C. will show that I agree with your "Anti Hot Potato QSO." When a fellow starts to "ease off" I grab his ear and chew on it till the milkman comes to break things up. I have made a lot of friends who would otherwise have slipped away.

Now that "OB" stuff — achh-fooey (spit) — has been a "cactus in the pants" for a long time. Whoever started that should be made to sit in a padded cell with a loud buzzer and send "OB" to himself for 20 years. Such stuff! I guess it affects all old timers the same way. Wonder how T.O.M. responds to it? I usually cover an "OB" ham up with an excess of "OM's" to get him out of the rut. It seems to work. "OM" seems to roll off the key easier than "OB" anyway.

That "BEST BEST 77333ssss" squib under "strays" by *CQ* sure is fine, too. I make it a practice to send nothing but 73 — it is enuff!

— *Arlington Bell, W2BKC, ex-2AAC* (*spk*)

The Hudson Division Convention

(*Continued from page 52*)

radio manufacturers who so generously contributed, and thanks of all delegates go to O'Hara, Spangenberg and the rest of the committee for a very successful affair.

— *A. A. H.*

Communications Department

(*Continued from page 64*)

VE2AP has been rebuilding. VE2BB is a top-liner this month. VE2BO is working on his crystal outfit. VE2HV is building a super unit for next fall. Our C.G.M. is busy with organization work. VE2BF in Metabetchouaw is a newcomer. VE2AC is busy preparing for 28-mc. work next fall. We need an amateur station in Montreal for the net for the American Legion. Who wants the job? VE2BO, VE2CO, VE2CU will resume operating soon. VE2CX has been operating on 14 mc. VE2CP is closing down. VE2DX is a newcomer whose call was formerly VE3XK. VE2CM has finished the power supply for his transmitter. VE2EM reports his first traffic handled via 3.5-mc. 'phone.

Traffic: VE2AP 66, VE2BE 70, VE2BB 172, VE2EM 22, VE2CP 31, VE2AC 171, VE2CL 5, VE2AA 14, VE2CX 11, VE2CA 19.

VANALTA DIVISION

ALBERTA — SCM, G. F. Barron, VE4EC — VE4EA reports QSOs with eleven ZLs, three VKs, three Gs, one F, one OH, VZX4X and a yacht in the Pacific. VE4GY was QSO a "J" station. VE4HM reports with some traffic. VE4EI continues on low power. VE4EC received his first QSL from a ZL.

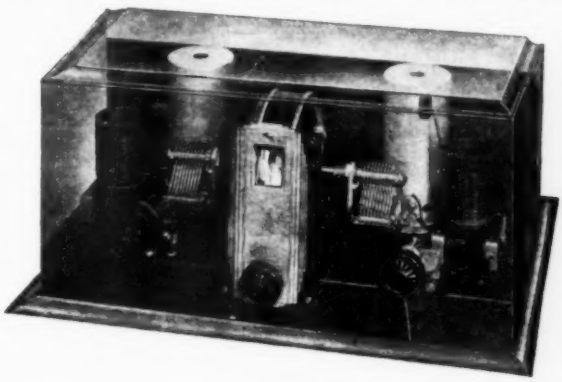
Traffic: VE4EI 14, VE4HM 7.

BRITISH COLUMBIA — SCM, J. K. Cavalsky, VE5AL — Two new stations, VE5DF and VE5DV, are all set to go. VE5EC is hitting DX. VE5CO has dropped to 14 mc. VE5HP had to leave 7 mc., as VAK is about one hundred yards away operating on 6.9 mc. VE5AI has his troubles, mostly BCL. VE5CB is experiencing some troubles on his six-tuber. VE5DQ uses his 3.5-mc. counterpoise as an antenna on 7 mc. VE5AM tried 'phone on 14 mc. VE5AC has more power coming up. VE5FI has a new transmitter. VE5AL would like a couple of morning schedules. VE5CF is in his busy season. VE5BC is back on the air. VE5CW is working on new receiver and transmitter. VE5DD

Outstanding A.C. Traffic-Tuner

NATIONAL A. C. THRILL-BOX SW5

A mechanically and electrically stable true A.C. High-Frequency Traffic-Tuner and Receiver for amateur use. Will work with different sorts of antennas without readjustment except of antenna trimmer. Once trimmer is set, Thrill-Box tunes and logs with true single control. Extremely simple to operate. 1080 dial degrees available between 21.2 m.c. and 2.61 m.c. Easily adapted to still wider spreading of bands, if desired with special band spreading coils. Works down to 33 m.c. Very smooth sensitivity control, no grunting, no backlash, or clicking on higher frequencies. No hand capacity.



New model uses the new UX 235 variable — Mu screen grid tubes. Push-pull audio, with special phone-jack before the last stage. Special broadcast receiving model is now available with 245 push-pull output. Also made in Low-drain D.C. Model.

Write to-day for Amateur Bulletin No. 146-Q

NATIONAL COMPANY INC., 61 SHERMAN ST., MALDEN, MASS.

FOR SALE

One radio transmitter complete, Western Electric. Output 1000 watts. Frequency range 500–1000 kilocycles. Modulated CW. Formerly operated as an auxiliary to station WEEI. All interested please communicate with S. R. Keyes, Purchasing Agent,

EDISON ELECTRIC ILLUMINATING CO.
39 Boylston Street — Boston, Mass.

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for Amplifiers and Special Impedance Matching Transformers

to meet precision requirements. *Write for information.*

FERRANTI, Inc.
130 W. 42d St. — New York

TRANSMISSION CONDENSERS

Cornell

Send for interesting data and price sheet on Transmission Condensers with working voltages up to 3000 D.C. for use with the following tubes: 203A, 204A, 210, 500W, 851, 852, 860, 865.

CORNELL ELECTRIC MFG. CO.
Long Island City — New York

TRANSFORMERS

3 KVA 3 phase 1500 — 2000 v. each side $65.00
700 watt 1000 — 1500 each side 14.50
250 watt 500—750—1000 each side
unmounted $10.00; mounted $11.50

Yale University, University of Cincinnati, University of North Dakota, State College of Texas, WTAD, WJAK, CJCN, KFXR are satisfied customers

W9CES FRANK GREBEN
1917 So. Peoria Street, Pilsen Sta. — Chicago, Ill.

.. Fill in attached coupon for details

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U. S. GOVERNMENT ACCREDITED TRAINING SCHOOL

In three to five months, we train you to pass government examination and secure your license. Examinations are held in our school about every 90 days. Our graduates are operating broadcasting stations in all parts of America, and many are travelling the seven seas as ship operators. If further details desired, mail coupon.

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POWER AMPLIFIERS PACKS SUPPLIES **A SPECIALTY**

Exclusive Eastern Distributors for

PURADYNE PRODUCTS

Reg. U.S. Pat. Off.

PURADYNE P.F. 50 power transformer 3000V. c.t. 500 watts in case with stand-off insulators.....**$16.00**

PURADYNE P.F. 250 power transformer 1200V. c.t. 2–7½V. windings, 200 watts.....**$4.50**

PURADYNE P.F. 245 power transformer 750V. c.t. 2½V. at 16 amps., 2½V. at 6 amps. and 5V. c.t. 150 watts, **$3.50**

PURADYNE 280 power transformer 600V.'c.t. 2½V., 1½V., 5V. 100 watts.....**$2.00**

PURADYNE 250-mil choke 20 Henrys 110 ohms d.c. resistance in metal case with stand-off insulators.....**$3.00**

PURADYNE 30-Henry 125-mil choke 260 ohms d.c. resistance.....**$1.00**

PURADYNE 30-Henry double choke as above.....**$1.75**

PURADYNE: Filament transformers 10,000V. insulation in metal cases with stand-off insulators:

2½V. — 12 amps. for 866s.....**$3.50**

7½V. — 6 amps. for 210s, 250s, 281s.....**$3.50**

10V. — 7½ amps. for 203As, 211s, 852s, 860s, 845s...**$4.00**

5V. — 20 amps. for 872s.....**$6.00**

12V. — 10 amps. for 204As, 212Ds.....**$4.50**

Special Filament Transformers 2–7½V. c.t. — 4 amps. each.....**$4.00**

PURADYNE .002, .006 — 6000V. plate blocking condensers with stand-off insulators.....**$.75**

WESTERN ELECTRIC 1 mfd. condenser 21AA 750V. a.c. test.....**$.50**

ACME Parvolt 2 mfd. 1000V. working, unmounted condensers but sealed in paraffin, guaranteed.....**$.75**

FARRAND 1 mfd. condensers 400V.....**$.20**

PURADYNE **guaranteed** transmitting filter condensers metal cased with stand-off insulators. All condensers rated at continuous working voltage:

Capacity	*1000 volts*	*1500 volts*	*2000 volts*	*3000 volts*
1 mfd.	$1.25	$2.00	$3.00	$ 6.00
2 mfd.	2.00	3.00	5.00	12.00
3 mfd.	2.50	3.50	6.50	28.00
4 mfd.	3.25	5.50	9.00	

PURADYNE 200 watt center-tapped transmitting grid-leaks in metal case with stand-off insulators:

5,000 ohms	$1.75	20,000 ohms	$2.50
10,000	2.00	30,000	2.75
15,000	2.25	50,000	3.75

OHMITE 150 watt gridleaks — 5000; 10,000 ohms; 11,000 ohms; 16,000 ohms; 17,000 ohms, each.....**75c**

PURADYNE microphone transformers. A transformer designed to fill the needs of broadcast stations, P.A. Systems, etc. Primary supplied in 100 or 200 ohms impedance. Secondary impedance, 400,000 ohms — neat shielded case, single button **$1.75** — double button.....**$3.50**

PURADYNE mike stands: Table model **$2.00**; floor model adjustable to 80 inches.....**$5.00**

NOTE: Jewell absolutely carries the most complete line of power amplifiers and public address systems. Send for literature.

FERRANTI three stage power amplifier first stage 1–227, 2–226, 2–250, 2–281, undistorted output 16 watts...**$75.00**

LAST MINUTE BARGAINS

PURADYNE guaranteed 866s extra heavy filament...**$5.50**

THORDARSON 210 power pack complete to work...**$15.00**

EVEREADY Raytheon Photo Electric Cells.....**$15.00**

OHMITE 245 tapped voltage divider 18,000 ohms, **$.50**

OHMITE 210 tapped voltage divider 42,000 ohms....**$1.50**

PURADYNE Condenser Block, 4-4-4-2 Mfd. 1000 Volts, working for 250 P. P. Packs.....**$5.00**

DEFOREST 545s — 50 watt tubes. New in original cartons. While they last.....**$14.00**

DEFOREST 566 mercury vapor rectifiers. Brand new in cartons. While they last.....**$6.00**

We Can Get Anything—At Jewell's Prices—Ask For It

Include postage with all orders and 20% deposit against C.O.D. shipments

Jewell Radio Company

58 Vesey St., Dept. S., New York City

keeps the SCM company on the golf course. We now boast a station in Nanaimo, VE5DM. VE5GF is once more active.

Traffic: VE5EC 4, VE5DQ 1, VE5AM 4, VE5AC 7, VE5AL 12, VE5FI 8, VE5CF 4.

PRAIRIE DIVISION

SASKATCHEWAN — SCM, W. J. Pickering, VE4FC — VE4BB and VE4BE have had good results on 14 mc. VE4IH reports QRN from dust storms. VE4GR finds it impossible to maintain schedules on 7 mc. VE4CQ is a new ham on 7 mc. VE4EJ, VE4EM and VE4FD are using 'phone on 3.5 mc. VE4CV has worked his first VK. VE4AT has been heard by HBR54 in Switzerland. VE4BA and VE4CV have been playing around on 28 mc.

Traffic: VE4BB 8, VE4IH 4, VE4GR 2, VE4CV 2, VE4BE 1.

LATE AND ADDITIONAL REPORTS

W8NP reported late; he is using crystal controlled rig.

Traffic: W8NP 81. (Oregon report received too late for inclusion:) W7AWH 533, W7ZD 132, W7ED 115, W7SY 60, W7APE 13, W7AVT 20, W7PE 8, W7AIG 3, W7QY 2, W7AID 2, W7EO 2.

Calls Heard

(*Continued from page 65*)

w6am w6ctp w6ewk w6yx w9bkz w9asq w9cru w9emy w9ss w9eel ve4cb ve4bq ve3cm cm2ww zx4xv hk1da

Thomas L. Greenwood, Opr. S.S. Casey KOQJ Between Pernambuco and Equator

7 mc. (April 14th–18th)

w1ask w1aso w1ave w1azd w1bft w1bmn w1coi w1cpv w1hz w1km w1mx w2afr w2alu w2avj w2bds w2bkg w2bnb w2bpa w2bxi w2byx w2cfq w2cnl w2coi w2cxf w2vh w2wy w3aho w3bes w3buy w3cch w3di w3md w3wk w3zk w4abs w4akg w4fi w4qj w4tp w4vp w6fr w8aef w8aqm w8ata w8bax w8bgp w8bgw w8blh w8ddg w8dfq w8djw w8dmd w8fi w8hg w8rw w8sh w8vo w9bxi w9cme w9fnk w9erz w9ges w9gg cm8yb ct1ge ear96 ear166 f8se on4xb pa0av veldu

14 mc.

w1aew w1ajl w1akv w1akz w1au w1avj w1awe w1axa w1bdl w1bhm w1bje w1cjb w1cyb w1fh w1hm w1wv w2adp w2ary w2agx w2bkt w2bkw w2buy w2bxa w2bzs w2cbu w2ccv w2cf w2ckw w2cmu w2cps w2cqx w2fd w2gw w2mb w2rs w3aj w3apo w3aqo w3bat w3nm w4dj w4hc w4hj w4nw w8ann w8bgv w8bkp w8bos w8cpc w8dbg w8dcs w8ded w8dpo w8dv w9brx w9ces w9dfj w9eta w9pk cm1by ear10 ear136 ear169 ei8b f8ej f8eo f8ex f8px f8swa fy2as g2cx g2by g2ol g2ux g5mb g6qb g6vp g6wt on4or pa0an pa0kw pa0wr pa0xf py1ca py1er py2bm py2bn py2bq py2qa py8ia py9an splae v1yb veldr ve3bf ve3ha w3dy (fone)

VK3YL, Miss Austine Marshall, "Ranelagh," 650 Dandenong Rd., Melbourne, Australia

7000-kc. band

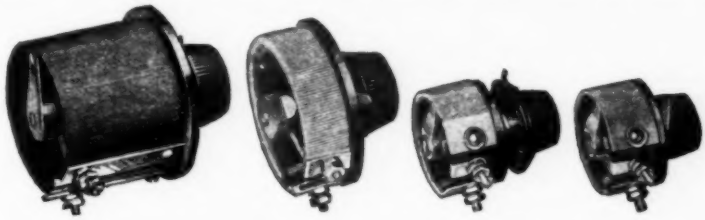
w1mx w1xuo w1km w2bac w2igo w2ano w2bvg w3hn w6am w6amz w6ahk w6ae w6bht w6bkm w6bax w6bqa w6cbj w6cul w6dwi w6dwy w6de w6dj w6dtt w6cek w6eep w6efq w6ek w6emk w6exq w6ej w6eaq w6fop w6og w6ph w7cyb w7lj w7aax w7hm w8azc w8doa w2amr w6ajl w7px w4ag zl1ar zl1ay zl1bn zl2gw zl2bz zl2dj zl2ab zl2gj zl3cm zl3ab zl3bg zl3aj zl3cv zl3cj zl3aa zl3cz zl3cc zl4bt zl4ba zl4bm ka1ce ka1hr ka1jr ka1pw k6boe k6cib ce1ah vp1ws vs6ag pk3bq g5by x3h om1tb st3wt vjny au1kog j3dd j3cc zl1ca zl2dn zl2co zl2xk k6cc k6dm pk1er ka1za cw8bm za2f ve1bv d2uan on4bg g2mq ct1bg cn8es w7ck w9avw

W5ACL, M. E. Lawson, Dallas, Texas

14-mc. phone band

ve3bt ve4ar w1axa w1uh w2alk w2ama w4agi w8cf w8wm w8bys w9bhm

RHEOSTATS AND POTENTIOMETERS



EVERY amateur knows General Radio rheostats and potentiometers for their excellent design and construction. They are inexpensive, and the line includes a wide variety of conservatively rated sizes in the four styles illustrated. Write for a copy of Bulletin 932-Q1 which describes them.

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1 in. square sections *(close to your specified frequency)*, supplied *promptly* at the following prices:

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(A Calibration furnished with each crystal)
Sections of any practicable dimensions made to order
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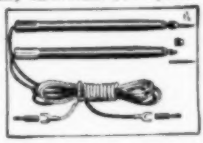

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UX281	$2.95	UY227	75c
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Type	*Wattage*	*Output voltage*	*Filament voltages*	*Price*
A	200	600–0–600	7½ ct and 7½ ct	$3.75
B	250	750–0–750		4.95
C	350	1000–0–1000		6.25
D	500	1500–0–1500		9.50
E	750	2000–0–2000		13.00
F	250	750–0–750	7½ ct and 7½ ct	5.75

FILAMENT TRANSFORMERS. An efficient sturdily constructed job. All secondaries centertapped. Mounted. Deduct 10% from these prices if no centertap is wanted.

Voltages	*12 Watts*	*25 Watts*	*50 Watts*
2½	$1.25	$1.95	$2.50
2½ and 2½	1.50	2.25	2.75
7½	1.25	1.95	3.25
7½ and 7½	....	2.25	3.95
10	....	....	3.40

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Capacity	*700 DC*	*1000 DC*	*1500 DC*	*2000 DC*
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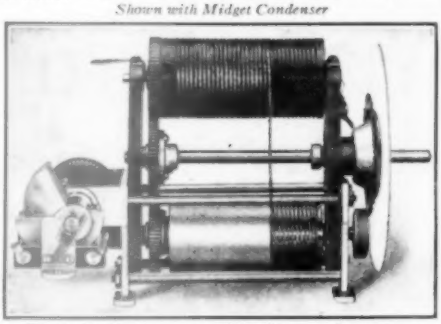
Below 18 Meters **THE VARI-COIL** *Over 100 Meters*

Shown with Midget Condenser



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550 CLAYTON STREET — DENVER, COLO.

14-mc. c.w.

bx1ba cm2rz f8rj fw4ap g2by g6rg lu3fa lu4dq oa4q oa4s py1ah py1ca py2ba py4fa rx1aa ve3bt ve3ft ve3rf ve4bq ve4cw ve4gy ve4ic ve5aw x1aa

7 mc.

ca1er cm1oe cm2jm cm2ww jhcq k4rj k6cib ka1ce ka1hr kfh om1tb ve2ac ve4bq ve4gj vk2jh vk2ns vk3bw vk3bz vk3em vk3hk vk3yx vk3zx vk4fb vk5xk vk6fl vk6mo vk6ss vk7jk vn2bg zl4ai zl4am

W9CNY, L. B. Coe, 805 N. W. Third Ave., Galva, Ill.

7000-kc. band

ve1bv ve2ac ve3ur vk3bz vk3hk vk3jk vk3ka vk3lz vk3nm vk3yl vk5ax vk5gr vk5it vk5xk vk7ch w6azu w6bb w6bvj w6bsd w6cpe w6cun w6cvv w6cxw w6ejs w6sn zl4ai om1tb ka1hr zl4

14,000-kc. band

py2bq py2bn w6dyz w6erc w7ajn

J. F. Quigley, 645 Polk Blvd., Des Moines, Iowa

3500-kc. phone band (March)

w1aby w1ajt w2aih w2aoe w2cbe w2cfn w2coj w2cyt w2qx w3bms w3wi w4ap w4aji w4fa w4lj w4pk w5agu w5anw w5arm w5axl w5aym w5azq w5bkq w5buf w5ka w5ru w5uj w6cfl w6crk w6dai w6eaz w7aao w7apd w8agx w8ahb w8ahf w8bke w8bre w8chb w8epf w8cti w8dmi w8doe w8dzq w8ebc ve3ei ve3wm ve4gm x5j

G6PP, M. W. Pilpel, 54 Purley Ave., London, N. W. 2, England

7- and 14-mc. bands

w1aal w1ae w1azy w1cel w1ft w1ge w1lk w1vv w1zm w2akd w2amr w2aoa w2apk w2ass w2ayn w2bax w2bdu w2bjf w2bro w2bti w2byt w2bzs w2cim w2cnr w2cpg w2ctd w2dk w2ft w2gk w2qn w2rp w3aou w3bhy w3cjn w3md w4apa w4jo w4jr w4ne w8anq w8aoq w8bck w8bfd w8bjx w8bsr w8chg w8pk w9cd w9cic w9eta v1aj zl3ar daiv

VK5GR, C. B. Ragles, South Rd., St. Mary's, South Australia

7000-kc. band

w1abl w1crw w1fh w1fs w1xp w2ano w2ans w2afr w2aup w2bda w2bqk w2bvg w2bqk w2cqa w2ku w3aoo w3amp w3adx w3awi w3nt w4ft w5acl w5aot w5ajr w5bmp w5bmv w6ahk w6ahp w6azh w6bfl w6bqc w6byz w6cig w6cii w6cak w6dtt w6dtz w6eak w6ecn w6eif w6ej w6ew w6exp w6ln w7gj w7rt w8bau w8bwk w8cb w8cga w9bil w9bqw w9civ w9cno w9cwx w9eip w9gdm w9oj w9um ve5co vs2af vs6af vs6af ka1cm ka1ce ka1dj ka1hr ka1pw ka1re ka1zc k6aja k6etc pk1co pk1cr pk3bq pk4hh j4ce om1tb vp1ws f8anc f8ek f8ji ct2ad ac8jj ac9gh au1nz ear14 ear98 pa0ik hh7c xf7c xoh5an xx3bmd

14,000-kc. band

w1asf w1abu w2bac w2bhw w2buy w2ccj w2cqc w2cvj w2im w2jn w2vd w3ajd w3bfh w3ld w4aby w4bc w4hj w5bob w5bgl w5brr w5buv w5ql w8aau w8azw w8cra w8dv w8fz w8lt w9adn w9auh w9def g5by g6rg g6nf vu2ah vu2ev vs2af vs7ai vs7ap ear21 d4wao f8pz f8wrg ct1aa pk3bq pk4hh oa4j oa4z obsk2 oh3na ok2cc ok2op st2d st3wt j1ec j3dd x1aa xf7c zs2n zs6y

VE3BF, C. W. Speer, 65 Rountree Ave., Toronto, Ont.

7- and 14-mc. bands

ce2be ce2fg ce3er cm1by cm1em cm2ef cm2iq cm2jm cm2sh cm2wn cm2wd cm5ea cn8mb ct1aa ct2aw cx2bt d2fg f3mts f3smi f8eo f8er f8gi f8je f8ji f8ol f8px f8sx f8sz f8tv f8vj g2by g5bj g5bz g5ml g6vp g6wn g6yk k4kd k4rj k4ug k6dmm kfu2 lu2ca lu3de lu4dq lu8djc lu9dt nn1nc on4bx on4gn on4jc py1aa py1em py1er py1fb py2ba py2bf pyhe2 py2bm py2bn py2bo py2bq py2ii py2qa py7an py9bk phpx1 ti2fg ti2wd vk2bx vk2ak vk3bb vk3ka vk3wl vk5da vk5kw vk5ra vo8ae x1aa zl1ar zl2gt zl3cc

New Tube! New Price 845B Modulator & Power Amplifier

Fil. Volts	10.
Fil. Amps	2.5
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Plate Current	65.
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* Has successfully withstood higher voltage

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Crystal Mountings	Quartz Crystals
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Fully Guaranteed

HEATER OVENS

Constant Temperature Heater Ovens less crystals, **$150.00** Accommodations for two crystals with change over switch. Range 35 to 65 degrees centigrade.

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Crystals and Mountings calibrated and furnished for following bands, at accuracies of plus or minus .1%, .03%, .01%:

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550–1500 kilocycle band — calibrated at any temperature plus or minus 500 cycles desired frequency complete with plug-in dust proof mounting — **$45.00.**

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Specialists in frequency precision

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300 mils—2 Henry—20 ohm. Great for Key Clicks. While they last:

$2.50 each, wt. packed, 14 lbs.

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VK3ZW, T. Delliott, 8 Agnes St., Mont Albert, Victoria, Australia

7000-kc. band

w1sz w1si w2anr w2ans w2ho w2rt w2afo w3cxl w3ant w3bfd w4fq w4pf w4akg w4ft w4gq w5td w5de w5cgp w6yu w6cub w6csk w6alu w6am w6bjf w6ddy w6amm w6fek w6bht w6dpa w6doz w6dqv w6ahw w6azh w6aog w6duj w6aor w6gn w6dwi w6cgp w6sf w6sa w6qp w6bo w6bl w6evf w6esg w6exq w6wo w6edo w6edt w6ehm w6cii w7cj w7alm w7fv w8blm w8baz w8dal w8bfd w9gv w9ckq w9ewu w9dbk w9ees ve4co k6exp k6eva k6edd k6wrw k6ewz k6boe k6dv k6bmn ka1hr ka1ee ka1pw ka1jr ka1su ka1cm ka1re pk3bq pk1jr pk1fh pk1cr f8aap f8whg f8cs f8xz f8dt f8oi f8ci f8by f8dp f8gq f8eq g1jp g2hz g2ew g2od g2vq g5bs i1ll i1au ear21 ear94 ear96 ear104 ear148 ear174 ct1ew ct1aa ct1ac ct1ee ce3cr ce3ab ex2bt aq1hf au1kok vs2af vp1ws vp1az on4er on4ft on4dr j2wv j3co j3cr om1tb ok3gy lu7dg hb9q zk1aa haf8b pa0bp ct9aa d4uan sp3mn vjlql xf7e geps f3ocb rx4y wr8yt om2cs

W7AEB, George Clarke, 423 Pacific St., Portland, Ore.

w1ala w1bsv w1gf w1mk w1mn w1rp w1rv w1eng w2ais w2ans w2aph w2apk w2dk w2cex w1aym w9ezu w9brr w4abs w4an w4ft w4jo w4rx w8lt w5atq w9afn w4daf w9bmm w5vo w5bhq w5fe ve4cy w5aie w9fef w9ces w9bmo w8rt w5adp w5abk w5bad w5bob w5pa w5ajr w5bpj w7ot w5af w5oy w5aea w4lt w8ci w9gkt w9gav w9amv w9ebo w9dx w9bbr w5vq w5abi w8bis w8ey w5ei w5rg w8im ve4di w9fkc w9bqe w9il w5ev ve5ev w5mw w5afx ve3cz w9bem w9yh w9bpm w8byr ve4bq w9asc ve4ih w4ll ve4dt w5bst w9fjg w9evd w9ffj w4ew w5bpf w9jl ve4dx w5gf w4fx w5bqe ve5dx w8api w9erl w9evd w5aud w8aup w9bqw ve4it w8ik ve5aw w5auw w5afb w9etw w8mv w5bol w9bjn w9fqj w9cet w9zf w9fgb w5afx w9dti w5apg w9gem w5ql w9aqs w8we w9euu w5uo w9bgd w8dm w9evn w5fn w9esi w9fkv w8sgx w3aew w5mm w8db w9bez w4mz w8aid w8emg w5uf w9gex w9aio w9exu w5ab w9bgz w8mk w9ghi w4uf w5hb w5xm w9jl w5bek w5boc w9cd ve4hy ve4ei w9evn w9adn w9ads w9fww w9dt w8od w9gex w9ehd w8jo w8yb ve4gq ve5cy w3ae ve3be w3cjn ve3ha w9gkt w9cm w9doc w9fqb w9edm w4ey w5lq w3bxw w3bhy zl4bt w5aja zl1bt k6doe tg1as k6eog x5z x29a zl3em em8ol vk2ns k6bsy zl2gw cm2jm ce1as zl2bd zl2as zl2in k6dm k6evw k6ed k6edd k6eme k6dud k6erh ka1cm ka1aw ka1ze x1aa x9a x9b rx1aa hh7e he1fg vk5dx vk8xc cm2xa w8bos

W2CPA, Willard Bohlen, Northwood Ave., Demarest, N. J.

w6abb w6alw w6aqj w6bdp w6bip w6bjc w6blx w6byb w6chy w6cuh w6cul w6dbt w6dev w6dgq w6dhp w6dmq w6doz w6eak w6ehy w6ekw w6elc w6ero w6ers w6eup w6eyj w6ezk w6id w6jn w6kx w6re w6sa w6ux w6vz w6yu w7ac w7afp w7aij w7ajj w7aul w7hx w7id w7lk w7mx w7nm w7qy w7td w7uw w7uy w7vn bx cm2wd ct1aa ct2ac earl0 ei8b f8bc g2dh g6rg g6vp g6wt he2jc lu4lq on4y on4z ti3a ve5cp ve5cu vo8aw vo8j vo8p zs4m zs6y zt1t zu6a

W8AXA, Bruce Hoag, 123 E. Matson Ave., Syracuse, N. Y.

7-mc. band

ct1ew ct3ab f8rok fm8ih g5by vk2dy vk2lx vk2nx vk3bw vk3hl vk3jk vk3ka vk3ml vk3pd vk3rj vk3tm vk3wl vk3wz vk3zx vk5gr vk5kw vk5wr vk7ch zl2gq zl3as

14-mc. band

ce3ch ce7aa cm1cm cm1fm cm2ay cm2cf cm2jm cm2pa cm2sh cm8uf cn8mop ct1aa ct1bx ct2aa cx1fb d4abg d4lrj d4uak ear16 ear94 ear96 ear98 earl16 earl18 earl36 earl85 ei2d ei8b ei8c f3smi f8cs f8dt f8enj f8eo f8ex f8fg f8fo f8ha f8jla f8kz f8lw f8pa f8pm f8pw f8pz f8rko f8rj f8rq f8tq f8tv f8uk f8xd fm8cr fm8lo fm8mst frear149 g2ao g2ay g2by g2cj g2dh g2kl g2ma g2mq g2nh g2op g2ux g2vq g5bj g5by g5bz g5cx g5dd g5ii g5la g5ma g5ml g5oc g5qf g5ey g5vm g5wq g5yg g6ga g6hp g6ix g6jg g6lk g6nf g6qb g6rb g6rg g6vp g6wz g6wt g6wy g6xn gi5nj he1fg hh7a ilra k4agv k4kd k4ug k7mn la1g lu1b lu2ea lu3fa lu4da lu8dje nj2pa on4s oh2ow oh7nd on4aa on4be on4dj on4fe on4fp on4fq on4gn on4he on4ja on4jb on4jj on4ro pa0fb pa0ga pa0gz pa0mm pa0ps pa0qf pa0qq pyle pylem py2az py2bk py2ba py2qa rx1aa sm5tc ti2fg ti3xa ts4eax ts4sup uo3wb vk2be vk2ra vk3hk vo8j vo8s vo8mc v1yb b7x daiv xw2ll

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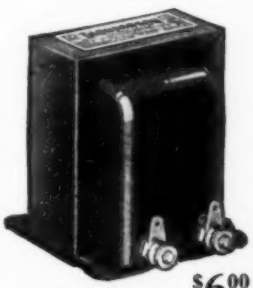

T-4843 $6.00

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Double Button

Model C

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Special to Amateurs Only $19.50

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See Page 88 This Issue

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A NEW RECTIFIER TO REPLACE 281

$3.50

No rewiring necessary to give higher voltage and provide more current in transmitting sets and power amplifiers. This tube is plugged into same socket as a 281 with no changes in circuit.

Filament Voltage	7.5 Volts
Filament Current	1.25 Amperes
Max. Inverse Peak	2500 Volts
Max. Current	250 M.A.
Approx. Voltage Drop	15 Volts

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7- and 14-mc. bands

au1bc au1aa vk2bk vk2cl vk2dc vk2dd vk2dk vk2dv vk2dy vk2gn vk2gq vk2hb vk2he vk2hm vk2hu vk2hq vk2jh vk2jo vk2jt vk2ka vk2kl vk2ku vk2lk vk2lx vk2mh vk2nb vk2na vk2ow vk2rl vk2ra vk2sa vk2sk vk2sv vk2wd vk2wu vk2yj vk2zk vk3bq vk3bm vk3bw vk3bz vk3bs vk3cp vk3cm vk3fm vk3gf vk3gp vk3gu vk3ha vk3hl vk3hk vk3hr vk3ij vk3jk vk3jw vk3ka vk3kv vk3ju vk3lz vk3ml vk3my vk3nm vk3nl vk3no vk3se vk3tb vk3vp vk3wl vk3wy vk3wx vk3xa vk3xi vk3yl vk3xa vk3zv vk3zx vk4bh vk4bk vk4bs vk4ds vk4ju vk4kx vk4ll vk4mg vk4pk vk4rp vk4rw vk5bg vk5cm vk5dx vk5dq vk5gr vk5hg vk5hq vk5ij vk5jo vk5mb vk5mf vk5kw vk5le vk5lx vk5pk vk5pt vk5pc vk5wa vk5wr vk5xk vk5zx vk6cb vk6jk vk6mo vk6mu vk6ow vk6sa vk6wi vk7eh vk7hl vk7jk vk7kl vk8xt zl1ak zl1ar zl1bg zl1bw zl1fl zl1ft zl1fv zl2ab zl2ae zl2az zl2gj zl2gk zl2gq zl2gt zl2gw zl2me zl2tv zl3aa zl3am zl3aw zl3bb zl3ai zl3aj zl3bc zl3cc zl3ex zl4ao zl4ba zl4bt k4kd k4rj k4rg k6aja k6awa k6bhr k6boh k6cog k6erw k6ees k6ed k6erh k60a k6xad k7ano k7atd cm1by cm1fm cm1oe cm2ay cm2cf cm2fe cm2pa cm2jm cm2sh cm2sl cm7sh cm8yb cm8kz pk3bq pk1er ka1ag ka1dg ka1hr ka1nf ka1jm ka1sl ka1za ka1ac x3a om1tb j1de j1dr j1dt j1dy j1ya hh7e pxr ex1af fw8fw vq4xx vzx4x iph rx1ac vp1ws xs5wa he1fg fcocb fn8cr ct1bx g2ay g2cj g2vq g2rd g5by g5is g5vm g5vq g6bh g6cg g6gj g6br g6qs g6rb g6vp g6xq f8ag f8pa f8ji f8pz f8yb pa0ar pa0oo pa0qg on4aa on4bc on4dj on4jf on4fc d4adq oa4b oa4g oa4j oa4q oa4t oa4w oa4z lu2ea lu3er lu3fa lu3dh lu8en lu8djc ti2fg ce3er ce1aa ce3dc ce7aa py1ca py1cn py2ba py2bn py2bj py2bq py6qa zt6a

I.A.R.U. News

(Continued from page 67)

the ZL's start rolling in, then a few VK's. They burst along intermittently, fading out during the early morning, then coming back in time to start another similar day."

As we all know, the time of day for all DX experiences seasonal and (we now recognize) multi-seasonal changes, but in general the relationship between the arrival of signals from different points remains much the same. Therefore, with summer now in the northern hemisphere, the typical day described above will start and close at a later hour, but the same relationships will probably be preserved. Amateurs in both the northern and southern hemispheres gauging their operating periods on the times given above should take this seasonal variation into consideration.

There remain but two more facts to emphasize in connection with this highly worth-while study. First, to repeat that the frequency band is 14 mc. Second, that the time is Eastern Standard, five hours behind G. C. T.

—·--·—

The following information on amateur radio conditions in Colombia, South America, comes from Robert E. Lee, ex-RL of W4LK, who is stationed there with the communications organization of the Pan American Airways. From their Barranquilla quarters he writes:

"Amateur radio telegraphy is not permitted here in Colombia at the present time, although it will be allowed as soon as the government feels able to control it. Since only telephony is permitted, most of the fellows have gone in for broadcasting. Of course, there are no doubt a

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Power crystals ground in the 550–1500 Kc band accurate to plus or minus 500 cycles of your specified frequency fully mounted for $55.00. In ordering please specify type tube, plate voltage and operating temperature. All crystals absolutely guaranteed regards to output and frequency and delivery can be made within two days after receipt of your order.

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We can supply heater units guaranteed to keep the temperature of the crystals constant to *better* than a tenth of 1 degree centigrade for $300.00. Two matched crystals, ground to your assigned frequency in the 550–1500 Kc band with the heater unit complete $410.00. More detailed description of this unit sent upon request.

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We invite your inquiries regards your crystal needs for Radio use. We will be glad to quote special prices for POWER crystals in quantity lots. We have been grinding *power* crystals for over *seven years;* being *pioneers* in this specialized field, we feel we can be of real service to you. We can grind *power crystals* to your specified frequency accurate to plus or minus .03%. All crystals guaranteed and prompt deliveries can be made. *A trial will convince you.*

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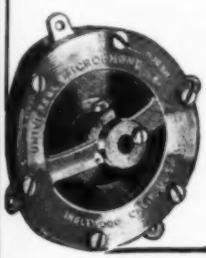

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Twelve watt output s.g. buffer tubes. 2.5 volt, 5 amp. filament, 400-600 volt plate, $10 each. (Above screen grid tubes are new and carry 30 day replacement).
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Five kw. s.g. water-cooled tubes. 10 volt, 45 amp. tung. filament, 3000-6000 plate. $75 and $100 each.
Cardwell transmitting variable condensers, type 166B (broadcast), $75 list. New condition, each $27.50.
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5000 volt test .002 Sangamo molded receiving type condensers 45c each.
2.5 kw. Marconi spark transformer with glass plate oil condensers. 110 volt primary, $20.
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(*Street or P. O. Box*)

(*City and State*)

few c.w. stations operating with bootleg calls and keeping under cover.

"All amateur activity is in the territory between 6000 and 6250 kc., and the private stations are assigned calls beginning with 'HK.' When an amateur secures a station license he makes a two-year contract with the government which states that the amateur must grant the government one-half hour's free service for each daily transmission, and that at the expiration of the contract the government may take over the station if it so desires. Contracts are very easily renewed, and no advantage has been taken of the last provision so far as is known. Neither has the government availed itself of the free service clause.

"The following are amateur 'phone stations: HKA, Barranquilla; HKB, Tunja; HKC, Bogotá; HKD, Barranquilla; HKF, Bogotá. All are of 50 or 100 watts power, with the exception of HKD, which is about the most successful station. He has a studio, good volunteer artists and personnel, yet employs merely a solitary Type '10 in a tuned-grid tuned-plate arrangement. This is modulated by a Type '50 in a Heising system. Plate input to the Type '10 is 24 watts, and the average modulated power in the antenna is about 16.8 watts. Modulation percentage is 73%, and the antenna is a Hertzian affair. He receives many letters from the United States, and intends to increase power soon.

"A few random observations: There are about 550 short-wave receivers in Barranquilla. Most of them are commercial a.c. jobs. Government stations are licensed with call signals beginning with 'HJ.' There are from 12 to 15 government stations, mostly long wave. It is very difficult to secure licenses for private commercial stations. United Fruit has one at Santa Marta, Andean Oil Company has three, and Scadta Airways has three. Latest reports indicate the possibility that amateur HKF may be or may have been taken over by the government — no confirmation of this."

The Union Schweiz Kurzwellen Amateure has elected new officers, whom we congratulate on their election, and present to radio amateurs everywhere. The well-known H. Degler continues in office as President. J. Schaedler replaces W. Schneeberger as Hon. Secretary, the latter assuming the duties of Traffic Manager. F. Wolf Wallisellen becomes Treasurer, while O. von Bergen takes over the QSL Forwarding department. Press relations and publicity are in the care of M. Rösgen.

The U.S.K.A. ended the official year with exactly 100 members, 17 of whom are licensed to transmit. Amateur radio is progressing steadily in this country, and it is expected soon to assume proportions of considerable magnitude, if the fond hopes of the mentors of U.S.K.A. are realized.

E. W. Mayer, K4KD, Ensenada, Porto Rico,

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No. 20 Series Single Control

No. 20 Series Single Control with A.C. Switch

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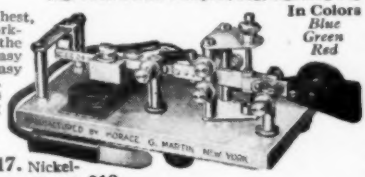

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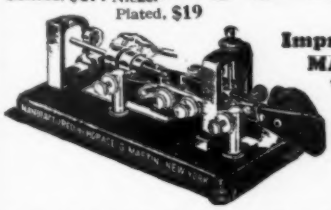

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SEE PAGE 83 THIS ISSUE

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contributes the following DX Time Table for his region, pointing out that in common with most others it varies greatly from similar tables prepared during previous years. This should be useful during the summer months if some allowance is made for seasonal change in the times, which are given in Eastern Standard, five hours behind G. C. T.

	14 mc.	*7 mc.*
North America		
Eastern	0700–1900	1700–0700
Western	1800–2100	2200–0700
South America		
Argentina	1700–2000	Not worked.
Brazil	1800–2000	1800–2000
Uruguay, Bolivia, Chile, Peru	1530–1800	0400–0600 Not worked.
Europe		
All countries	1500–1830	1700–2000
Africa		
Algiers	1630–1800	2030–0100
Morocco	1800–1900	Not worked.
South Africa	Not worked.	2400–1000
Asia		
Iraq	1730–1930	2030–2400
Afghanistan	1700–1830	Not worked.
Oceania		
Australia	2400–0200	0430–0600
New Zealand	2330–0130	0400–0600

British Report

By J. Clarricoats, Hon. Sec'y R.S.G.B.

Amateurs throughout the world will join in congratulating Trevor Evans, VK2NS, on winning the "B.E.R.W. Challenge Trophy," presented to the station effecting the most contacts with British Empire stations during British Empire Radio Week. Mr. Evans scored 64 points, 55 of which were obtained by working New Zealand stations.

Many of our old B.E.R.U. members returned excellent reports. Zone certificates have been awarded to Mr. Fred Miles, G5ML (42 points); Mr. Rahim, VS7AP (40 points); Mr. Hamblin, YI6HT (46 points); Mr. Sampson, ZL4AI (41 points); Mr. N. H. Auret, ZU6W (26 points); Mr. H. Mohrstadt, SU1AQ (21 points); Mr. Earle Turner, VE2CA (16 points); Mr. H. W. Cox, VQ4CRF (19 points); and Mr. J. O'Brien, VS6AE (24 points).

We take this opportunity of thanking everyone who assisted in any way to make our premier B.E.R.W. a success. The Council in London look to our large overseas membership to forward suggestions for future Empire projects.

The recent 1.7-mc. tests proved an unqualified success, the winner of the transmitting trophy being Mr. J. B. Scott, EI7C. Mr. Winchcombe, G6ZH, the present holder, was runner-up only two points behind. Miss Barbara M. Dunn, G6YL, again won the receiving trophy. The one-watt tests were well supported, and many interesting contacts were established. The results will appear in the "T & R Bulletin."

The final London meeting for the season was held on April 29th, when Mr. G. G. Blake, M.I.E.E., chose as his subject "A Journey into the World of Science." About 150 persons were

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Aero Shortwave Converter Superheterodyne. Converts your AC or DC radio set into a short wave superheterodyne 15 to 200 meters.....**$12.50**

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Complete Phone and CW Transmitter 15 to 30 Watts, **$39.50** including tuned plate, tuned grid oscillator with provision for crystal control. Wired for one or two UX 210 tubes. One or two UX 250's as modulators, two stages of speech amplification. Mounted in beautiful two-tone Walnut cabinet. Has ample space for AC power supply. Price includes one Stromberg-Carlson microphone.

Power Supply Unit for 15 to 30 Watt Transmitter **$19.75.** Will deliver 600 volt 150 milliamperes for plate current. Has filament for 281, 210, 250, 277, and 226 tubes.

World Wide 2-Tube Short Wave Receiver. $11.75. A two-tube receiver in a beautiful shielded metal cabinet. An ideal all around set which will give loud speaker reception on many stations. Very flexible in tuning. Complete with a set of 6 clip-in coils. Covers 14 to 550 meters. Can be used with any standard base tubes.

Tubes UX Type, 30 day replacement guarantee, No. 210, **$2.25**; No. 250, **$2.35**; No. 281, **$1.85**; No. 280, **95c**; No. 245, **$1.25**; No. 224, **$1.25**; No. 227, **75c**; No. 226, **65c**; No. 171, **75c.**

Low Power Transmitter, adaptable for phone or code. With plug-in Coils.....**$14.75**

Short Wave Sets, one tube complete with 5 coils, 14 to 550 meters.....**$6.45**

Stromberg-Carlson telephone transmitter on desk stand, **$2.75**

B Eliminator, Dry. 180 volts, will operate up to 10-tube set, with 280 tube, fully guaranteed.....**$6.75**

AC-A. B. C. Power Packs, completely assembled.....**$8.75** 250 V. B. also has A. C. filament for up to 9-tube set. Can be used as B eliminator. Make your battery set all electric, or build your A. C. set around this pack. 280 tube for this pack, **95c** extra.

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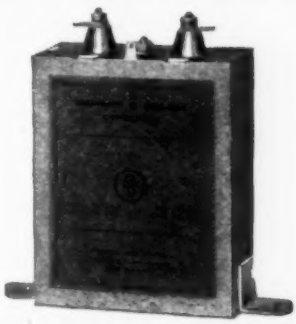

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'11	507–8	10,000	1.50
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'04A	507–51	10,000	3.50

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present. The paper is being published in the "T & R Bulletin." The recent lecture delivered by Mr. Eric Megaw in which he described work carried out below one meter, is also being published in our journal.

Interested amateurs are invited to join the Society; full particulars can be obtained from the Honorary Secretary, R.S.G.B., 53 Victoria St., London, S.W. 1, England.

Norwegian Report

By G. H. Petersen, Pres. N.R.R.L.

The results of the Norwegian Message Relay Tests during March proved that reliable inland communication might be established at any time, using either the 3.5- or 7-mc. band. The tests also showed that our amateurs are able operators, and every step is being taken to establish relay lines for League work. The winner of the contest was LA2B, B. F. Larsen, Vestsidens Apotek, Fredriksstad.

DX Conditions, especially on 14 mc., continue to improve, and the expected utility of our lower frequency bands for DX is also increasing.

South African Report

By Dr. S. H. Walters, S.A.R.R.L. Correspondent

The Annual Conference of the South African Radio Relay League was opened on April 4th by our new President, the Governor General, His Excellency the Earl of Clarendon, late chairman of the British Broadcasting Corporation. His address was inspiring, and our enhanced status should be a direct benefit.

Constitutional matters, a perennial problem, were suitably dealt with and a new scheme which will be more representative was suggested to Headquarters. It was decided to hold the next conference at Port Elizabeth.

The proceedings were relayed by ZS1P on 7 mc. and this was a huge success. 7 mc. has been thrown open to 'phone for the ensuing year.

ZU1J, ex-G6UO, is leaving for Japan. Our good wishes accompany him.

14-mc. DX has been poor, with 7 mc. giving better results, but even on this frequency skip distance and wipe-out has made its appearance earlier than usual.

The Annual Convention of the Krátko-Vlnni Amatéři Československí, one of the amateur societies of Czechoslovakia, was held in Prague, the capital of the country, on April 18th. It proved to be quite successful, amateurs from most districts in Czechoslovakia being present. The following officers were elected:

President: Dr. Jar. Šafránek
Vice-president: Ingenieur J. Buchar
Secretary: Professor V. Vopička
Treasurer: Prav. Motyčka